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EP04/53021

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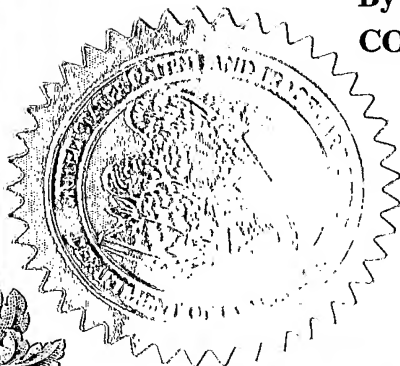
APPLICATION NUMBER: 60/540,990

FILING DATE: February 02, 2004

PRIORITY DOCUMENT

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

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INVENTOR(S)

| Given Name (first and middle [if any]) | Family Name or Surname | Residence (City and either State or Foreign Country) |
|--|------------------------|---|
| DENNIS IAN | CUTILLO DONALDSON | SANFORD, FLORIDA DELTONA, FLORIDA |

☒ Additional inventors are being named on the 1 separately numbered sheets attached hereto**TITLE OF THE INVENTION (500 characters max)**

OMCI OBJECT MODEL FOR MANAGING xDSL INTERFACES

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ENCLOSED APPLICATION PARTS (check all that apply)☐ Specification Number of Pages☐ CD(s), Number☐ Drawing(s) Number of Sheets☒ Other (specify)☐ Application Data Sheet. See 37 CFR 1.7667 combined pages of
spec and drawings**METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT**☐ Applicant claims small entity status. See 37 CFR 1.27.☐ A check or money order is enclosed to cover the filing fees☒ The Director is hereby authorized to charge filing
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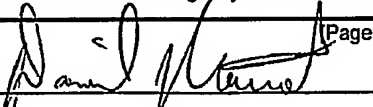
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(Page 1 of 2)

Date

02/02/04

TYPED or PRINTED NAME

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REGISTRATION NO.
(if appropriate)

34,733

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407-736-4149

Docket Number:

2004P01557US

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Additional Page

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| Docket Number | | 2004P01557US |
| INVENTOR(S)/APPLICANT(S) | | |
| Given Name (first and middle (if any)) | Family or Surname | Residence (City and either State or Foreign Country) |
| KIET (JEFF) V. | TRUONG | OVIEDO, FLORIDA |

[Page 2 of 2]

Number 1 of 1

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Working Document IU09_v3

| | | | |
|--------------|---|---|------------------|
| Question(s): | 2 | Meeting, date: | 11 December 2003 |
| Study Group: | 15 | Working Party: | 1 |
| Source: | Editors | Intended type of document (R-C-D-TD): | |
| Title: | G.omci.xdsl v3 | | |
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Please don't change the structure of this table, just insert the necessary information.

<Contribution XXX>

G.omci.xdsl

Summary

This document provides ONT Management and Control Interface (OMCI) support for the Broadband Passive Optical Network (B-PON) system defined in ITU-T G.983.1 [1] for select functions which were out of the scope of ITU-T G.983.2 [2] and ITU-T G.983.8 [3]. OMCI support is specified for ONTs with ADSL and VDSL interfaces.

1 Scope

This document focuses on the OMCI specifications related to support for ONTs with ADSL and VDSL interfaces. Though the OMCI specifications are based on ITU-T G.983.2 [2] and ITU-T G.983.8 [3], some enhancements are needed. The scope of this Recommendation is limited to the enhancements only.

This document includes additions to sections of ITU-T G.983.2 [2] that pertain to these topics. As this document serves as an extension of ITU-T G.983.2 [2], all sections of that Recommendation remain pertinent.

2 References

The following ITU-T Recommendations and other references contain provisions that, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T G.983.1 (1998), *Broadband optical access systems based on Passive Optical Networks (PON)*.
- [2] ITU-T G.983.2 (2002), *ONT management and control interface specification for ATM PON*.
- [3] ITU-T G.983.8 (2003), *B-PON OMCI support for IP, ISDN, Video, VLAN Tagging, VC Cross-Connections and other select functions*.

3 Abbreviations

This Recommendation uses the following abbreviations:

| | |
|-------|---|
| ANI | Access Network Interface |
| ADSL | Asymmetrical Digital Subscriber Line |
| ATU-C | ADSL Transceiver Unit, Central office end |
| ATU-R | ADSL Transceiver Unit, Remote Terminal End |
| B-PON | Broadband Passive Optical Network |
| DSL | Digital Subscriber Line |
| MAC | Media Access Control |
| ME | Managed Entity |
| MIB | Management Information Base |
| MMPDU | MAC Management Protocol Data Unit |
| MPDU | MAC Protocol Data Unit |
| MSDU | MAC Service Data Unit |
| OLT | Optical Line Terminal |
| OMCI | ONT Management and Control Interface |
| ONT | Optical Network Terminal |
| ONU | Optical Network Unit |
| PHY | Physical layer |
| PM | Performance Monitoring |
| PSD | Power Spectral Density |
| RFI | Remote Failure Indication |
| SNR | Signal to Noise Ratio |
| UNI | User Network Interface |
| VDSL | Very High Speed DSL |
| VTU-O | VDSL Transceiver Unit, ONU end (a.k.a. VTU-C) |
| VTU-R | VDSL Transceiver Unit, Remote Terminal end |

4 Reference Model and Terms

See clause 4/G.983.2.

5 Requirements of the management interface specification

See clause 5/G.983.2.

5.1 Configuration management

See clause 5.1/G.983.2.

5.2 Fault management

The following performance management-related managed entities are added to the list given in clause 5.2/G.983.2.

- k) Physical Path Termination Point ADSL UNI
- j) Physical Path Termination Point VDSL UNI

5.3 Performance management

The following performance management-related managed entities are added to the list given in clause 5.3/G.983.2.

- p) ADSL ATU-C Performance Monitoring History Data
- q) ADSL ATU-R Performance Monitoring History Data
- r) ADSL ATU-C Channel Performance Monitoring History Data
- s) ADSL ATU-R Channel Performance Monitoring History Data
- t) TC Adaptor Performance Monitoring History Data ADSL
- t) VTU-O Physical Interface Monitoring History Data
- u) VTU-R Physical Interface Monitoring History Data
- v) VTU-O Channel Performance Monitoring History Data
- w) VTU-R Channel Performance Monitoring History Data

5.4 Security management

See clause 5.4/G.983.2.

6 Protocol-independent MIB for the OMCI

See clause 6/G.983.2.

6.1 Managed entities associated with xDSL interfaces

The managed entities in Table 1/G.omci.xdsl are defined in addition to the managed entities defined in Recommendation G.983.2.

Table 1/G.omci.xdsl Additional managed entities in the OMCI

| Managed Entity | Required/Optional | Description |
|--|-------------------|---|
| ADSL Line Configuration Profile Part 1 | CR | Contains the Line Parameters for an ADSL line |
| ADSL Line Configuration Profile Part 2 | CR | Contains the Line Parameters for an ADSL line |
| ADSL Line Configuration Profile Part 3 | CR | Contains the Line Parameters for an ADSL line |
| ADSL Subcarrier Masking Downstream Profile | CR | Contains masking information for the Downstream subcarriers |

| Managed Entity | Required/Optional | Description |
|--|-------------------|--|
| ADSL Subcarrier Masking Upstream Profile | CR | Contains masking information for the Upstream subcarriers |
| ADSL Downstream PSD Mask Profile. | CR | Contains Masking information for the Downstream PSD |
| ADSL Downstream RFI Bands Profile | CR | Contains information on the Downstream RFI Bands |
| ADSL Channel Configuration Profile | CR | Contains Configuration for a Channel |
| ADSL Line Inventory and Status Data Part 1 | CR | Contains the inventory and status information on the ADSL Line |
| ADSL Line Inventory and Status Data Part 2 | CR | Contains the inventory and status information on the ADSL Line |
| ADSL Channel Downstream Status | CR | Contains status on the Downstream Channel. |
| ADSL Channel Upstream Status | CR | Contains status on the Upstream Channel |
| ADSL ATU-C Channel Performance Monitoring History Data | O | Performance monitoring data for an ADSL ATU-C channel |
| ADSL ATU-C Performance Monitoring History Data | O | Performance monitoring data for an ADSL ATU-C modem Path |
| ADSL ATU-R Channel Performance Monitoring History Data | O | Performance monitoring data for an ADSL ATU-R Channel |
| ADSL ATU-R Performance Monitoring History Data | O | Performance monitoring data for an ADSL ATU-R modem path |
| TC Adaptor Performance Monitoring History Data ADSL | O | Performance monitoring data for the ADSL ATM Data Path |
| Physical Path Termination Point ADSL UNI Part 1 | CR | Used for the physical path termination point at an ADSL CO modem |
| Physical Path Termination Point ADSL UNI Part 2 | CR | Used for the physical path termination point at an ADSL CO modem |
| Physical Path Termination Point VDSL UNI | CR | Used for the physical path termination point at a VDSL connection |
| VDSL Band Plan Configuration Profile | CR | Parameters used to configure a VDSL Band Plan Configuration Profile. |
| VDSL Channel Configuration Profile | CR | Parameters used to configure a VDSL Channel Configuration Profile. |
| VDSL Channel Data | CR | Contains the Channel Parameters for VDSL Fast and Slow channels. |
| VDSL Line Configuration Profile | CR | Parameters used to configure a VDSL Line Configuration Profile. |

| Managed Entity | Required/Optional | Description |
|--|-------------------|---|
| VDSL VTU-O Channel Performance Monitoring History Data | O | Performance monitoring data for a VDSL VTU-O channel |
| VDSL VTU-O Physical Data | CR | Contains the Physical Layer Parameters for a VTU-O. |
| VDSL VTU-O Physical Interface Monitoring History Data | O | Monitoring Data for a VDSL VTU-O Physical Interface |
| VDSL VTU-R Channel Performance Monitoring History Data | O | Performance monitoring data for an VDSL VTU-R channel |
| VDSL VTU-R Physical Data | CR | Contains the Physical Layer Parameters for a VTU-R. |
| VDSL VTU-R Physical Interface Monitoring History Data | O | Monitoring Data for a VDSL VTU-R Physical Interface |

6.2 Managed Entity diagrams

The relationships between the required xDSL managed entities are given in Figures 2/G.omci.xdsl and 3/G.omci.xdsl.

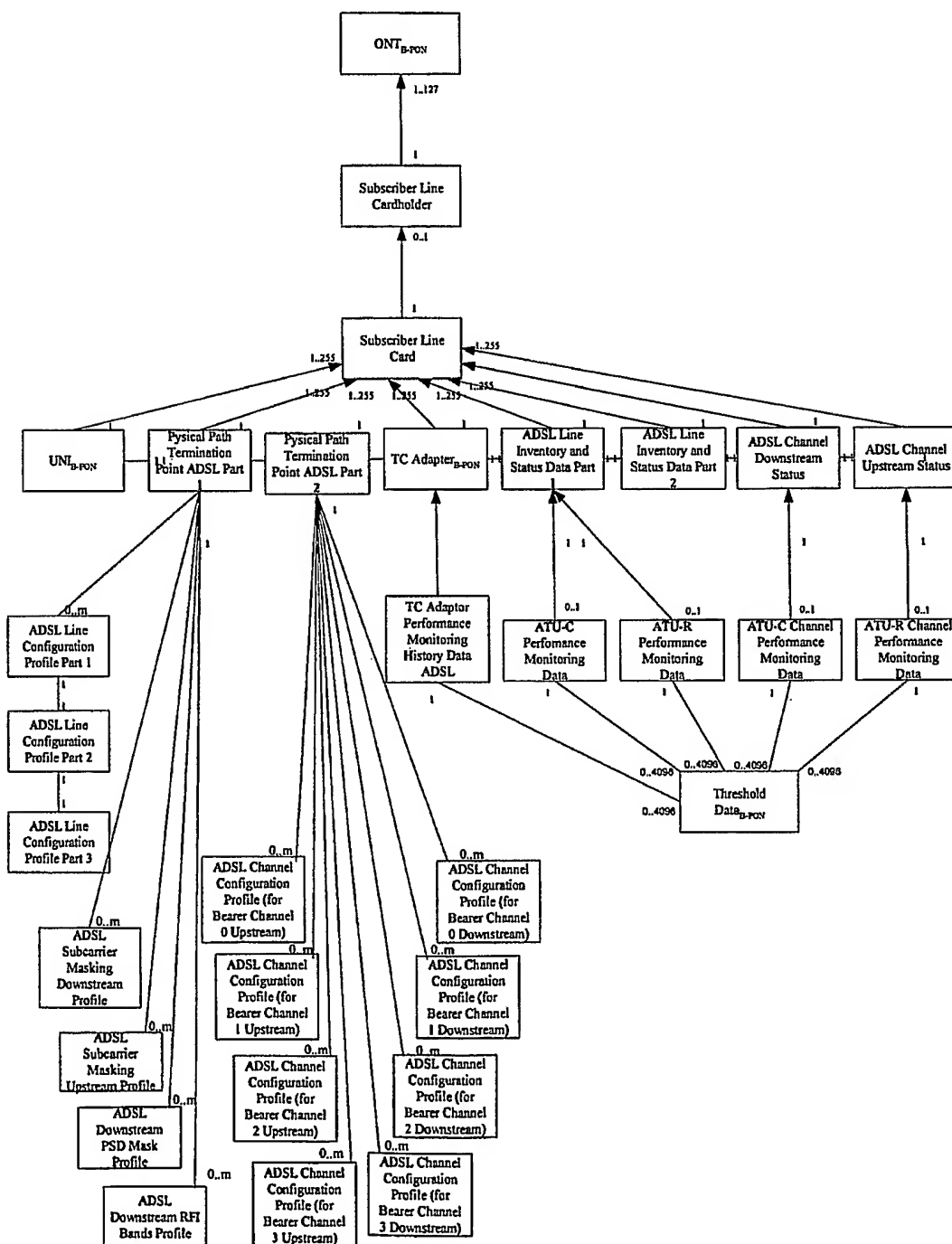


Figure 2/G.omci.xdsl Managed Entity Relation Diagram for ADSL Interfaces

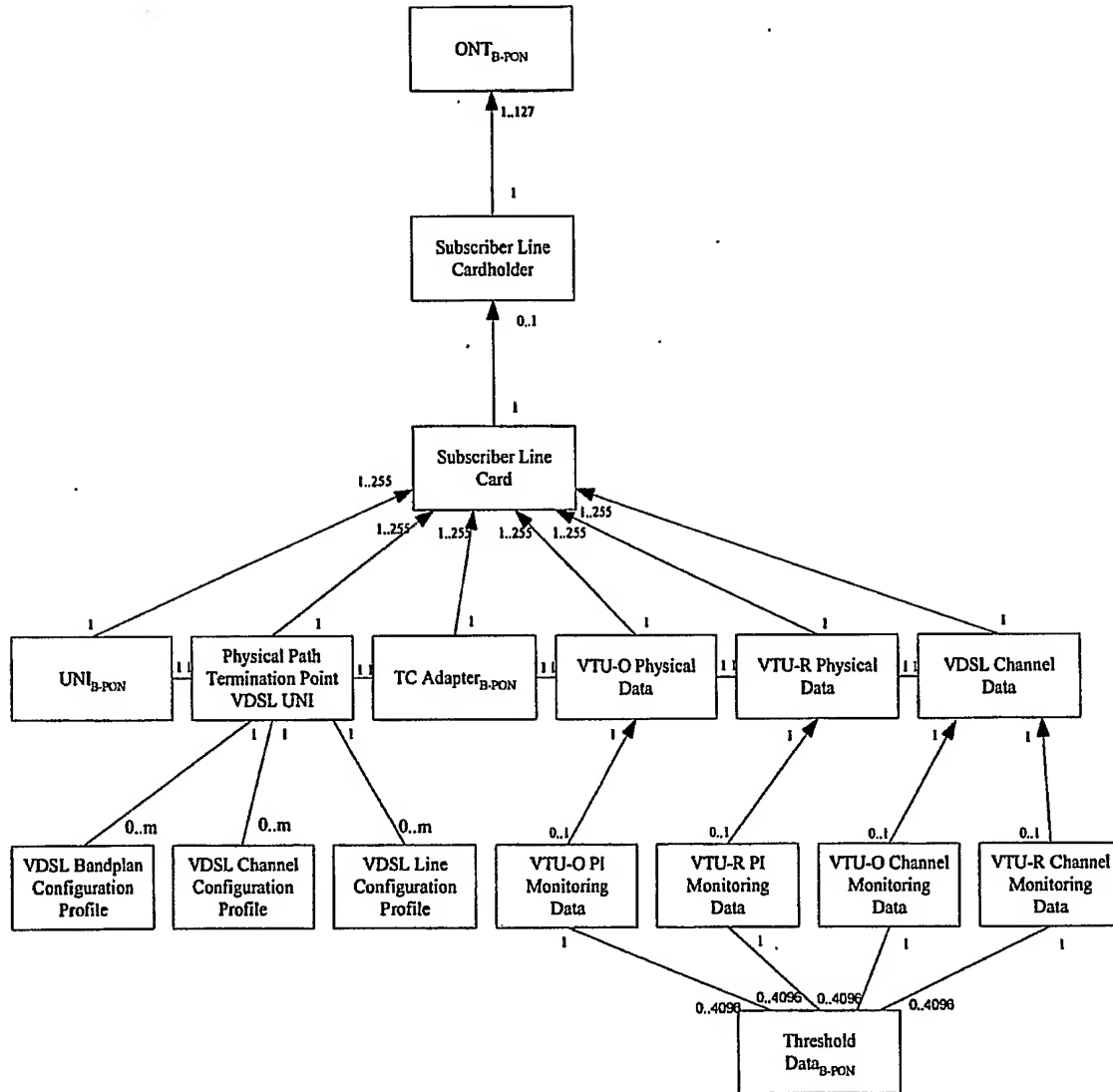


Figure 3/G.omci.xdsl Managed Entity Relation Diagram for VDSL Interfaces

7 Modified Managed Entities

7.1 Threshold Data B-PON

Under the Relationship section, add the following Managed Entities to the existing list of PM Managed Entities:

- ADSL ATU-C Channel Performance Monitoring History Data
- ADSL ATU-C Performance Monitoring History Data
- ADSL ATU-R Channel Performance Monitoring History Data
- ADSL ATU-R Performance Monitoring History Data
- TC Adaptor Performance Monitoring History Data ADSL
- VDSL VTU-O Channel Performance Monitoring History Data
- VDSL VTU-O Physical Interface Monitoring History Data
- VDSL VTU-R Channel Performance Monitoring History Data
- VDSL VTU-R Physical Interface Monitoring History Data

8 New Managed Entities for xDSL management

8.1 ADSL

8.1.1 Physical Path Termination Point ADSL UNI Part 1

This managed entity represents the point at an ATM UNI in the ONT where physical paths terminate to an ADSL CO Modem.

One or more instances of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of ADSL type.

Establishment of a "Physical Path Termination Point ADSL UNI"

The Physical Path Termination Point ADSL UNI is auto created when the Subscriber Line Card of type ADSL is created. On auto creation the 5 profile pointers within the Managed Entity are set to their default values of 0x00. However, the PPTP ADSL UNI Part 1 must refer to 5 valid profiles before it can be operational.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as ADSL type.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the

| | |
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| | physical position of the UNI. The first byte is the slot id (defined in G.983.2/Section 7.1.3). The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes) |
| Loopback Configuration: | This attribute represents the loopback configuration of this physical interface. Value 0x00: no loopback; value 0x01: loopback2 ("Loopback2") refers to a loopback at the ONT to the OLT. The OLT can execute a physical level loopback test after loopback2 is set.). Upon autonomous instantiation, the value 0x00 is used. (R, W) (mandatory) (1 byte) |
| Administrative State: | This attribute is used to activate (unlock: value 0x00) and deactivate (lock: value 0x01) the functions performed by instances of this managed entity. Selection of a default value for this attribute is outside the scope of this document as it is normally handled through supplier-operator negotiations. (R, W) (mandatory) (1 byte) |
| Operational State: | This attribute indicates whether or not this managed entity is capable of performing its task. The operational state reflects the perceived ability to receive or to generate a valid signal. Valid values are enabled (0x00) and disabled (0x01). (R) (optional) (1 byte) |
| ADSL Line Configuration Profile : | This attribute provides a pointer to an instance of the ADSL Line Configuration Profile managed entity that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Line Configuration Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes) |
| ADSL Subcarrier Masking Downstream Profile: | This attribute provides a pointer to an instance of the ADSL Subcarrier Masking Downstream Profile managed entity that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Subcarrier Masking Downstream Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes) |
| ADSL Subcarrier Masking Upstream Profile: | This attribute provides a pointer to an instance of the ADSL Subcarrier Masking Upstream Profile managed entity that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Subcarrier Masking Upstream Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes) |
| ADSL Downstream PSD Mask Profile: | This attribute provides a pointer to an instance of the ADSL Downstream PSD Mask Profile managed entity that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Downstream PSD Mask Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes) |
| ADSL Downstream RFI Bands Profile: | This attribute provides a pointer to an instance of the ADSL Downstream RFI Bands Profile managed entity that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Downstream RFI Bands Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes) |

ARC: This attribute is used to control alarm reporting from this managed entity. Valid values are "off" (alarm reporting allowed immediately) and "on" (alarm reporting inhibited). Upon initial installation and provisioning of the ONT, this attribute may be set to "on" or "off" for the time interval specified by "ARCInterval." Similarly, this attribute may be set to "off". If the attribute is set to "on", then alarm reporting is inhibited until this managed entity detects a valid signal for the time interval specified by "ARCInterval." The default value is ON. (R, W) (optional) (1 byte).

ARCInterval: This attribute provides a provisionable length of time. Units are given in minutes. The default value is 2. (R, W) (optional) (1 byte).

Actions

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

Attribute value change: This notification is used to report autonomous changes of attributes of this managed entity. The notification shall identify the attribute and its new value. The AVCs for this managed entity are given in Table 2/G.omci.xdsl

Table 2/G.omci.xdsl - AVC list for Physical Path Termination Point ADSL UNI

| Number | AVC | Description |
|--------|----------|-------------------|
| 1 | N/A | |
| 2 | OpState | Operational state |
| 3 | N/A | |
| 4 | N/A | |
| 5 | N/A | |
| 6 | N/A | |
| 7-16 | Reserved | |

Alarm: This notification is used to notify the management system when a failure has been detected or cleared. Both ONT and OLT should know the alarm list used by this entity. The alarms for this entity are given in Table 3/G.omci.xdsl.

Table 3/G.omei.xdsl Alarm list for Physical Path Termination Point ADSL UNI

| Number | Event | Description |
|--------|----------|-------------------------|
| | Alarm | |
| 0 | NE_LOF | Near End Loss of Frame |
| 1 | NE_LOS | Near End Loss of Signal |
| 2 | NE_LOL | Near End Loss of Link |
| 3 | NE_LPR | Near End Loss of Power |
| 4 | CARD_ALM | Card in Alarm |
| 5 | FE_LOF | Far End Loss of Frame |
| 6 | FE_LOS | Far End Loss of Signal |
| 7 | FE_LOL | Far End Loss of Link |
| 8 | FE_LPR | Far End Loss of Power |

8.1.2 Physical Path Termination Point ADSL UNI Part 2

This managed entity represents the point at an ATM UNI in the ONT where physical paths terminate to an ADSL CO Modem.

One or more instances of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of ADSL type.

Establishment of a "Physical Path Termination Point ADSL UNI"

The Physical Path Termination Point ADSL UNI is auto created when the Subscriber Line Card of type ADSL is created. On auto creation the 8 profile pointers within the Managed Entity are set to their default values of 0x00. However, the PPTP ADSL UNI Part 2 must refer to at least 2 valid profiles before it can be operational.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as ADSL type.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot id (defined in G.983.2/Section 7.1.3). The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes)

ADSL Channel Configuration Profile (For Bearer Channel 0 Downstream): This attribute provides a pointer to an instance of the ADSL Channel Configuration Profile managed entity for Bearer Channel 0 Downstream that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Channel Configuration Profile. The value 0x00 is the default value, which

| | |
|--|---|
| | is set when this ME is auto created. (R, W) (mandatory) (2 bytes) |
| ADSL Channel Configuration Profile (For Bearer Channel 1 Downstream): | This attribute provides a pointer to an instance of the ADSL Channel Configuration Profile managed entity for Bearer Channel 1 Downstream that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Channel Configuration Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes) |
| ADSL Channel Configuration Profile (For Bearer Channel 2 Downstream): | This attribute provides a pointer to an instance of the ADSL Channel Configuration Profile managed entity for Bearer Channel 1 Downstream that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Channel Configuration Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes) |
| ADSL Channel Configuration Profile (For Bearer Channel 3 Downstream): | This attribute provides a pointer to an instance of the ADSL Channel Configuration Profile managed entity for Bearer Channel 3 Downstream that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Channel Configuration Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes) |
| ADSL Channel Configuration Profile (For Bearer Channel 0 Upstream): | This attribute provides a pointer to an instance of the ADSL Channel Configuration Profile managed entity for Bearer Channel 0 Upstream that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Channel Configuration Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes) |
| ADSL Channel Configuration Profile (For Bearer Channel 1 Upstream): | This attribute provides a pointer to an instance of the ADSL Channel Configuration Profile managed entity for Bearer Channel 1 Upstream that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Channel Configuration Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes) |
| ADSL Channel Configuration Profile (For Bearer Channel 2 Upstream): | This attribute provides a pointer to an instance of the ADSL Channel Configuration Profile managed entity for Bearer Channel 2 Upstream that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Channel Configuration Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes) |
| ADSL Channel Configuration Profile (For Bearer Channel 3 Upstream): | This attribute provides a pointer to an instance of the ADSL Channel Configuration Profile managed entity for Bearer Channel 3 Upstream that contains the data necessary for initializing an ADSL MODEM. The value 0x00 is used to indicate that this ME does not point to an ADSL Channel Configuration Profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes) |

Actions

| | |
|-------------|-----------------------------|
| Get: | Get one or more attributes. |
| Set: | Set one or more attributes. |

Actions

None.

8.1.3 ADSL Line Inventory and Status Data Part 1

This managed entity contains the Line Inventory Data for an ADSL line. One or more instances of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of ADSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as ADSL type. All attributes other than Managed Entity id will default to zero.

Attributes

| | |
|---------------------------------|---|
| Managed Entity id: | This attribute provides a unique number for each instance of this managed entity. The assigned number is the same as the id of the Physical Path Termination Point ADSL UNI with which this ADSL Line Inventory Data is associated. (R) (mandatory) (2 bytes) |
| ATU-C G.994.1 Vendor ID: | The ATU-C G.994.1 Vendor ID is the Vendor ID as inserted by the ATU-C in the G.994.1 CL message. It consists of 8 binary octets, including a country code followed by a (regionally allocated) provider code, as defined in Recommendation T.35. (R) (optional) (8 bytes) |
| ATU-R G.994.1 Vendor ID: | The ATU-R G.994.1 Vendor ID is the Vendor ID as inserted by the ATU-R in the G.994.1 CLR message. It consists of 8 binary octets, with same format as the ATU-C G.994.1 Vendor ID (R) (optional) (8 bytes) |
| ATU-C System Vendor ID: | The ATU-C System Vendor ID is the Vendor ID as inserted by the ATU-C in the Overhead Messages (G.992.3 and G.992.4). It consists of 8 binary octets, with same format as the ATU-C G.994.1 Vendor ID. (R) (optional) (8 bytes) |
| ATU-R System Vendor ID: | The ATU-R System Vendor ID is the Vendor ID as inserted by the ATU-R in the Embedded Operations Channel (G.992.1 and G.992.2) and the Overhead Messages (G.992.3 and G.992.4). It consists of 8 binary octets, with same format as the ATU-C G.994.1 Vendor ID (R) (optional) (8 bytes) |
| ATU-C Version Number: | The ATU-C version number is the version number as inserted by the ATU-C in the Overhead Messages (G.992.3 and G.992.4). It is for version control and is vendor specific information. It consists of up to 16 binary octets (R) (optional) (16 bytes) |
| ATU-R Version Number: | The ATU-R version number is the version number as inserted by the ATU-R in the Embedded Operations Channel (G.992.1 and G.992.2) or Overhead Messages (G.992.3 and G.992.4). It is for version control and is vendor specific information. It consists of up to 16 binary octets. (R) |

| | |
|--|--|
| | (optional) (16 bytes) |
| ATU-C Serial Number: | The ATU-C serial number is the serial number as inserted by the ATU-C in the Overhead Messages (G.992.3 and G.992.4). It is vendor specific information. It consists of up to 32 ASCII characters. (R) (optional) (32 bytes) |
| ATU-R Serial Number: | The ATU-R version number is the version number as inserted by the ATU-R in the Embedded Operations Channel (G.992.1 and G.992.2) or Overhead Messages (G.992.3 and G.992.4). It is vendor specific information. It consists of up to 32 ASCII characters. (R) (optional) (32 bytes) |
| ATU-C Self Test Results: | This parameter defines the ATU-C self-test result. It is coded as a 32-bit integer. The most significant octet of the self-test result is 00hex if the self-test passed and 01hex if the self-test failed. The interpretation of the other octets is vendor discretionary and can be interpreted in combination with G.994.1 and system Vendor IDs. (R) (optional) (4 bytes) |
| ATU-R Self Test Results: | This parameter defines the ATU-R self-test result. It is coded as a 32-bit integer. The most significant octet of the self-test result is 00hex if the self-test passed and 01hex if the self-test failed. The interpretation of the other octets is vendor discretionary and can be interpreted in combination with G.994.1 and system Vendor IDs. (R) (optional) (4 bytes) |
| ATU-C Transmission System Capability: | This parameter defines the ATU-C transmission system capability list of the different coding types. It is coded in a bit-map representation with the bits defined in Table 4/G.omci.xdsl. (R) (optional) (7 bytes) |
| ATU-R Transmission System Capability: | This parameter defines the ATU-R transmission system capability list of the different coding types. It is coded in a bit-map representation with the bits defined in Table 4/G.omci.xdsl. (R) (optional) (7 bytes) |
| Initialization: Success/Failure Cause | <p>This parameter represents the success or failure cause of the last full initialisation performed on the line. It is coded as an integer in the 0 to 5 range, coded as follows:</p> <ul style="list-style-type: none">0 Successful1 Configuration error This error occurs with inconsistencies in configuration parameters. E.g., when the line is initialized in an ADSL Transmission system where an ATU does not support the configured Maximum Delay or the configured Minimum or Maximum Data Rate for one or more bearer channels.2 Configuration not feasible on the line This error occurs if the Minimum Data Rate cannot be reached on the line with the Minimum Noise Margin, Maximum PSD level, Maximum Delay and Maximum Bit Error Ratio for one or more bearer channels.3 Communication problem This error occurs e.g. due to corrupted messages or bad syntax messages or if no common mode can be selected in the G.994.1 handshaking procedure or due to a timeout.4 No peer ATU detected This error occurs if the peer ATU is not powered or not |

connected or if the line is too long to allow detection of a peer ATU.

- 5 Any other or unknown Initialization Failure cause. (R) (optional) (1 byte)

Initialization: Last State Transmitted Downstream

This parameter represents the last successful transmitted initialization state in the downstream direction in the last full initialization performed on the line. Initialization states are defined in the individual ADSL Recommendations and are counted from 0 (if G.994.1 is used) or 1 (if G.994.1 is not used) up to Showtime. This parameter must be interpreted along with the ADSL Transmission System.

This parameter is available only when, after a failed full initialization, the line diagnostics procedures are activated on the line. Line diagnostics procedures can be activated by the operator of the system (through the Line State Forced line configuration parameter) or autonomously by the ATU-C or ATU-R.

(R) (optional) (1 byte)

Initialization: Last State Transmitted Upstream

This parameter represents the last successful transmitted initialization state in the upstream direction in the last full initialization performed on the line. Initialization states are defined in the individual ADSL Recommendations and are counted from 0 (if G.994.1 is used) or 1 (if G.994.1 is not used) up to Showtime. This parameter must be interpreted along with the ADSL Transmission System.

This parameter is available only when, after a failed full initialization, the line diagnostics procedures are activated on the line. Line diagnostics procedures can be activated by the operator of the system (through the Line State Forced line configuration parameter) or autonomously by the ATU-C or ATU-R.

(R) (optional) (8 bytes)

Actions

Get: Get one or more attributes.

Notifications

None.

Table 4/G.omci.xdsl ATU Transmission System Table

The following is an explanation of the ATU Transmission Attribute in the ADSL Managed entity. It is coded in a bit-map representation (0 if not allowed, 1 if allowed) with following definition:

| Bit | Representation |
|---------|--|
| Octet 1 | |
| 1 | ANSI T1.413 |
| 2 | Annex C of TS 101 388 v1.3.1 |
| 3 | G.992.1 operation over POTS non-overlapped spectrum (Annex A of G.992.1) |

| Bit | Representation |
|---------|--|
| 4 | G.992.1 operation over POTS overlapped spectrum (Annex A of G.992.1) |
| 5 | G.992.1 operation over ISDN non-overlapped spectrum (Annex B of G.992.1) |
| 6 | G.992.1 operation over ISDN overlapped spectrum (Annex B of G.992.1) |
| 7 | G.992.1 operation in conjunction with TCM-ISDN non-overlapped spectrum (Annex C of G.992.1) |
| 8 | G.992.1 operation in conjunction with TCM-ISDN overlapped spectrum (Annex C of G.992.1) |
| Octet 2 | |
| 9 | G.992.2 operation over POTS non-overlapped spectrum (Annex A of G.992.2) |
| 10 | G.992.2 operation over POTS overlapped spectrum (Annex B of G.992.2) |
| 11 | G.992.2 operation in conjunction with TCM-ISDN non-overlapped spectrum (Annex C of G.992.2) |
| 12 | G.992.2 operation in conjunction with TCM-ISDN overlapped spectrum (Annex C of G.992.2) |
| 13 | Reserved |
| 14 | Reserved |
| 15 | Reserved |
| 16 | Reserved |
| Octet 3 | |
| 17 | Reserved |
| 18 | Reserved |
| 19 | G.992.3 operation over POTS non-overlapped spectrum (Annex A of G.992.3) |
| 20 | G.992.3 operation over POTS overlapped spectrum (Annex A of G.992.3) |
| 21 | G.992.3 operation over ISDN non-overlapped spectrum (Annex B of G.992.3) |
| 22 | G.992.3 operation over ISDN overlapped spectrum (Annex B of G.992.3) |
| 23 | Reserved |
| 24 | Reserved |
| Octet 4 | |
| 25 | G.992.4 operation over POTS non-overlapped spectrum (Annex A of G.992.4). |
| 26 | G.992.4 operation over POTS overlapped spectrum (Annex A of G.992.4). |
| 27 | Reserved. |
| 28 | Reserved. |
| 29 | G.992.3 All Digital Mode operation with non-overlapped spectrum (Annex I of G.992.3). |
| 30 | G.992.3 All Digital Mode operation with overlapped spectrum (Annex I of G.992.3). |
| 31 | G.992.3 All Digital Mode operation with non-overlapped spectrum (Annex J of G.992.3). |
| 32 | G.992.3 All Digital Mode operation with overlapped spectrum (Annex J of G.992.3). |
| Octet 5 | |
| 33 | G.992.4 All Digital Mode operation with non-overlapped spectrum (Annex I of G.992.4). |
| 34 | G.992.4 All Digital Mode operation with overlapped spectrum (Annex I of G.992.4). |
| 35 | G.992.3 Reach Extended operation over POTS, Mode 1 (non-overlapped, wide upstream) (Annex L of G.992.3) |
| 36 | G.992.3 Reach Extended operation over POTS, Mode 2 (non-overlapped, narrow upstream) (Annex L of G.992.3) |
| 37 | G.992.3 Reach Extended operation over POTS, Mode 3 (overlapped, wide upstream) |

| Bit | Representation |
|---------|--|
| | (Annex L of G.992.3) |
| 38 | G.992.3 Reach Extended operation over POTS, Mode 4 (overlapped, narrow upstream) (Annex L of G.992.3) |
| 39 | G.992.3 Extended upstream operation over POTS non-overlapped spectrum (Annex M of G.992.3) |
| 40 | G.992.3 Extended upstream operation over POTS overlapped spectrum (Annex M of G.992.3) |
| Octet 6 | |
| 41 | G.992.5 operation over POTS non-overlapped spectrum (Annex A of G.992.5) |
| 42 | G.992.5 operation over POTS overlapped spectrum (Annex A of G.992.5) |
| 43 | G.992.5 operation over ISDN non-overlapped spectrum (Annex B of G.992.5) |
| 44 | G.992.5 operation over ISDN overlapped spectrum (Annex B of G.992.5) |
| 45 | Reserved |
| 46 | Reserved |
| 47 | G.992.5 All Digital Mode operation with non-overlapped spectrum (Annex I of G.992.5). |
| 48 | G.992.5 All Digital Mode operation with overlapped spectrum (Annex I of G.992.5). |
| Octet 7 | |
| 49 | G.992.5 All Digital Mode operation with non-overlapped spectrum (Annex J of G.992.5). |
| 50 | G.992.5 All Digital Mode operation with overlapped spectrum (Annex J of G.992.5). |
| 51 | G.992.5 Extended upstream operation over POTS non-overlapped spectrum (Annex M of G.992.5) |
| 52 | G.992.5 Extended upstream operation over POTS overlapped spectrum (Annex M of G.992.5) |
| 53 | Reserved |
| 54 | Reserved |
| 55 | Reserved |
| 56 | Reserved |

8.1.4 ADSL Line Inventory and Status Data Part 2

This managed entity contains the Line Status Data for an ADSL line. One or more instances of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of ADSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as ADSL type.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. The assigned number is the same as the id of the Physical Path Termination Point ADSL UNI with which this ATU-R Physical Data is associated. (R) (mandatory) (2 bytes)

ADSL Transmission System:

This parameter defines the transmission system in used. It is coded in bitmap representation with the bits defined in Table 4/G.omci.xdsl. (R) (optional) (7 bytes)

Line Power Management State

The Line has four possible power management states, numbered 0 to 3 and corresponding to respectively:

- 0 = L0 - Synchronized - This Line state (L0) is when the Line has full transmission (i.e. showtime).
- 1 = L1 - Power Down Data transmission - This line state (L1) is when there is transmission on the line but the net data rate is reduced (e.g. only for OAM and higher layer connection and session control). This state applies to G.992.2 only.
- 2 = L2 - Power Down Data transmission - This line state (L2) is when there is transmission on the line but the net data rate is reduced (e.g. only for OAM and higher layer connection and session control). This state applies to G.992.3 and G.992.4 only.
- 3 = L3 - No-power - This Line state (L3) is when there is No Power transmitted on the line at all. (R) (optional) (1 byte)

Downstream Line Attenuation:

This parameter is the measured difference in the total power transmitted by the ATU-C and the total power received by the ATU-R over all subcarriers during diagnostics mode and initialization. The downstream line attenuation ranges from 0 to +127 dB with 0.1 dB steps. A special value indicates the line attenuation is out of range to be represented. (R) (optional) (2 bytes)

Upstream Line Attenuation:

This parameter is the measured difference in dB in the total power transmitted by the ATU-R and the total power received by the ATU-C over all subcarriers during diagnostics mode and initialization. The upstream line attenuation ranges from 0 to +127 dB with 0.1 dB steps. A special value indicates the line attenuation is out of range to be represented. (R) (optional) (2 bytes)

Downstream Signal Attenuation:

This parameter is the measured difference in the total power transmitted by the ATU-C and the total power received by the ATU-R over all subcarriers during showtime. The downstream line attenuation ranges from 0 to +127 dB with 0.1 dB steps. A special value indicates the line attenuation is out of range to be represented. (R) (optional) (2 bytes)

Upstream Signal Attenuation:

This parameter is the measured difference in dB in the total power transmitted by the ATU-R and the total power received by the ATU-C over all subcarriers during showtime. The upstream line attenuation ranges from 0 to +127 dB with 0.1 dB steps. A special value indicates the line attenuation is out of range to be represented. (R) (optional) (2 bytes)

Downstream Signal-to-Noise Ratio Margin:

The downstream signal-to-noise ratio margin is the maximum increase in dB of the noise power received at the ATU-R, such that the BER requirements are met for all downstream bearer channels. The downstream SNR margin ranges from -64 dB to +63 dB with 0.1 dB steps. A special value indicates the parameter is out of range to be represented (R) (optional) (2 bytes)

Upstream Signal-to-Noise Ratio Margin:

The upstream signal-to-noise ratio margin is the maximum increase in dB of the noise power received at the ATU-C, such that the BER requirements are met for all upstream bearer channels. The upstream SNR

margin ranges from -64 dB to +63 dB with 0.1 dB steps. A special value indicates the parameter is out of range to be represented. (R) (optional) (2 bytes)

Downstream Maximum Attainable Data Rate: This parameter indicates the maximum downstream net data rate currently attainable by the ATU-C transmitter and the ATU-R receiver. The rate is coded in bit/s. (R) (optional) (4 bytes)

Upstream Maximum Attainable Data Rate: This parameter indicates the maximum upstream net data rate currently attainable by the ATU-R transmitter and the ATU-C receiver. The rate is coded in bit/s. (R) (optional) (4 bytes)

Downstream Actual Power Spectrum Density: This parameter is the average downstream transmit power spectrum density over the used subcarriers (subcarriers to which downstream user data are allocated) delivered by the ATU-C at the U-C reference point, at the instant of measurement. The power spectrum density level ranges from -90 dBm/Hz to 0 dBm/Hz with 0.1 dB steps. A special value indicates the parameter is out of range to be represented.

NOTE – The downstream actual power spectrum density is the sum (in dB) of the REFPSDs and RMSGLDs. (R) (optional) (2 byte)

Upstream Actual Power Spectrum Density: This parameter is the average upstream transmit power spectrum density over the used subcarriers (subcarriers to which upstream user data are allocated) delivered by the ATU-C at the U-C reference point, at the instant of measurement. The power spectrum density level ranges from -90 dBm/Hz to 0 dBm/Hz with 0.1 dB steps. A special value indicates the parameter is out of range to be represented.

NOTE – The upstream actual power spectrum density is the sum (in dB) of the REFPSDs and RMSGLDs. (R) (optional) (2 bytes)

Downstream Actual Aggregate Transmit Power: This parameter is the total amount of transmit power delivered by the ATU-C at the U-C reference point, at the instant of measurement. The total output power level ranges from -31 dBm to +31 dBm with 0.1 dB steps. A special value indicates the parameter is out of range to be represented.

NOTE – The downstream nominal aggregate transmit power may be taken as a best estimate of the parameter. (optional) (2 bytes)

Upstream Actual Aggregate Transmit Power: This parameter is the total amount of transmit power delivered by the ATU-R at the U-R reference point, at the instant of measurement. The total output power level ranges from -31 dBm to +31 dBm with 0.1 dB steps. A special value indicates the parameter is out of range to be represented.

NOTE – The upstream nominal aggregate transmit power may be taken as a best estimate of the parameter. (R) (optional) (2 bytes)

Actions

Get: Get one or more attributes.

Notifications

None.

8.1.5 ADSL Channel Downstream Status Data

This managed entity contains the ADSL Channel Downstream Status Data.. One or more instances of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of ADSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as ADSL type.

Attributes

| | |
|-----------------------------------|---|
| Managed Entity id: | This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The two most significant bits of the first byte is the Bearer Channel ID. The six least significant bits of the first byte is the slot id (defined in G.983.2/Section 7.1.3). The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes) (R) (mandatory) (2 bytes) |
| Actual Interleaving Delay: | This parameter is the actual one-way interleaving delay introduced by the PMS-TC between the alpha and beta reference points excluding delay in L1 and L2 state. In L1 and L2 state, the parameter contains the interleaving delay in the previous L0 state. This parameter is derived from the S and D parameters as $\lceil S \cdot D \rceil / 4$ ms, where "S" is the Symbols per codeword, and "D" is the "Interleaving Depth" and $\lceil x \rceil$ denotes rounding to the higher integer. The Actual Interleaving Delay is coded in ms rounded to the nearest ms. (R) (optional) (1 byte) |
| Actual Data Rate: | This parameter reports the actual net data rate the bearer channel is operating at excluding rate in L1 and L2 states. In L1 or L2 states, the parameter contains the net data rate in the previous L0 state. The data rate is coded in bit/s. (R) (optional) (4 bytes) |
| Previous Data Rate: | This parameter reports the previous net data rate the bearer channel was operating at just before the latest rate change event occurred excluding all transitions between L0 state and L1 or L2 states. A rate change can occur at a power management state transition, e.g., at full or short initialization, fast retrain, or power down or at a dynamic rate adaptation. The rate is coded in bit/s (R) (optional) (4 bytes) |

Actions

Get: Get one or more attributes.

Notifications

None.

8.1.6 ADSL Channel Upstream Status Data

This managed entity contains the ADSL Channel Upstream Status Data.

One or more instances of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of ADSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as ADSL type.

Attributes

| | |
|-----------------------------------|---|
| Managed Entity id: | This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The two most significant bits of the first byte is the Bearer Channel ID. The six least significant bits of the first byte is the slot id (defined in G.983.2/Section 7.1.3). The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes) (R) (mandatory) (2 bytes) |
| Actual Interleaving Delay: | This parameter is the actual one-way interleaving delay introduced by the PMS-TC between the alpha and beta reference points excluding delay in L1 and L2 state. In L1 and L2 state, the parameter contains the interleaving delay in the previous L0 state. This parameter is derived from the S and D parameters as $\lceil S \cdot D \rceil / 4$ ms, where "S" is the Symbols per codeword, and "D" is the "Interleaving Depth" and $\lceil x \rceil$ denotes rounding to the higher integer. The Actual Interleaving Delay is coded in ms (rounded to the nearest ms). (R) (optional) (1 byte) |
| Actual Data Rate: | This parameter reports the actual net data rate the bearer channel is operating at excluding rate in L1 and L2 states. In L1 or L2 states, the parameter contains the net data rate in the previous L0 state. The data rate is coded in bit/s. (R) (optional) (4 bytes) |
| Previous Data Rate: | This parameter reports the previous net data rate the bearer channel was operating at just before the latest rate change event occurred excluding all transitions between L0 state and L1 or L2 states. A rate change can occur at a power management state transition, e.g., at full or short initialization, fast retrain, or power down or at a dynamic rate adaptation. The rate is coded in bit/s (R) (optional) (4 bytes) |

Actions

Get: Get one or more attributes.

Notifications

None.

8.1.7 ADSL Line Configuration Profile Part 1

This managed entity contains part 1 of the Line Configuration Profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the Physical Path Termination Point ADSL UNI.

Attributes

| | |
|--|---|
| Managed Entity id: | This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes) |
| ATU Transmission System Enabling: | This configuration parameter defines the transmission system coding types to be allowed by the near-end ATU on this line. This parameter only applies to the Q-interface. It is coded in a bit-map representation with the bits defined in Table 4/g.omci.xdsl. (R, W, Set-by-create) (optional) (7 bytes) |
| Power Management State Forced: | <p>This configuration parameter defines the line states to be forced by the near-end ATU on this line. It is coded as an integer value with following definition:</p> <ol style="list-style-type: none">0 Force the line to transition from the L3 idle state to the L0 full-on state. This transition requires the (short) initialization procedures. After reaching the L0 state, the line may transition into or exit from the L2 low power state (if L2 state is enabled). If the L0 state is not reached (after a vendor discretionary number of retries and/or within a vendor discretionary timeout), then an Initialization Failure occurs. Whenever the line is in the L3 state, attempts shall be made to transition to the L0 state until it is forced into another state through this configuration parameter.2 Force the line to transition from L0 full on to L2 low power state. This transition requires the entry into L2 mode. This is a out-of-service test value for triggering the L2 mode.3 Force the line to transition from the L0 full-on or L2 low power state to the L3 idle state. This transition requires the (orderly) shutdown procedure. After reaching the L3 state, the line shall remain in the L3 idle state until it is forced into another state through this configuration parameter. (R, W, Set-by-create) (optional) (1 byte) |

| | |
|---|---|
| Power Management State Enabling: | <p>This configuration parameter defines the line states the ATU-C or ATU-R may autonomously transition to on this line. It is coded in a bit-map representation (0 if not allowed, 1 if allowed) with following definition:</p> <p>Bit 0: L3 state (Idle state)</p> <p>Bit 1: L1/L2 state (Low power state)</p> <p>(R, W, Set-by-create) (optional) (1 byte)</p> |
| Downstream Target Noise Margin: | <p>This is the Noise Margin the ATU-R receiver shall achieve, relative to the BER requirement for each of the downstream bearer channels, or better, to successfully complete initialization. The target noise margin ranges from 0 to 31 dB with 0.1 dB steps. (R, W, Set-by-create) (optional) (2 bytes)</p> |
| Upstream Target Noise Margin: | <p>This is the Noise Margin the ATU-C receiver shall achieve, relative to the BER requirement for each of the upstream bearer channels, or better, to successfully complete initialization. The target noise margin ranges from 0 to 31 dB with 0.1 dB steps. (R, W, Set-by-create) (optional) (2 bytes)</p> |
| Downstream Maximum Noise Margin: | <p>This is the maximum noise margin the ATU-R receiver shall try to sustain. If the Noise Margin is above this level, the ATU-R shall request the ATU-C to reduce the ATU-C transmit power to get a noise margin below this limit (if this functionality is supported – see note). The maximum noise margin ranges from 0 to 31 dB with 0.1 dB steps. A special value of 0xFF is used to indicate that no Maximum Noise Margin limit is to be applied. (R, W, Set-by-create) (optional) (2 bytes)</p> |
| Upstream Maximum Noise Margin: | <p>This is the maximum noise margin the ATU-C receiver shall try to sustain. If the Noise Margin is above this level, the ATU-C shall request the ATU-R to reduce the ATU-R transmit power to get a noise margin that is below this limit (if this functionality is supported – see note). The maximum noise margin ranges from 0 to 31 dB with 0.1 dB steps. A special value of 0xFF is used to indicate that no Maximum Noise Margin limit is to be applied. (R, W, Set-by-create) (optional) (2 bytes)</p> |
| Downstream Minimum Noise Margin: | <p>This is the minimum Noise Margin the ATU-R receiver shall tolerate. If the noise margin falls below this level, the ATU-R shall request the ATU-C to increase the ATU-C transmit power. If an increase to ATU-C transmit power is not possible, a loss-of-margin (LOM) defect occurs, the ATU-R shall fail and attempt to re-initialize and the NMS shall be notified. The minimum noise margin ranges from 0 to 31 dB with 0.1 dB steps. (R, W, Set-by-create) (optional) (2 bytes)</p> |
| Upstream Minimum Noise Margin: | <p>This is the minimum Noise Margin the ATU-C receiver shall tolerate. If the noise margin falls below this level, the ATU-C shall request the ATU-R to increase the ATU-R transmit power. If an increase of ATU-R transmit power is not possible, a loss-of-margin (LOM) defect occurs, the ATU-C shall fail and attempt to re-initialize and the NMS shall be notified. The minimum noise margin ranges from 0 to 31 dB with 0.1 dB steps (R, W, Set-by-create) (optional) (2 bytes)</p> |
| Downstream Rate Adaptation Mode: | <p>This parameter specifies the mode of operation of a rate-adaptive ATU-C in the transmit direction. The parameter can take three values.</p> <p>1 = Mode 1: MANUAL - Rate changed manually.</p> |

At startup:

The Downstream Minimum Data Rate parameter specifies the data rate the ATU-C transmitter shall operate at for each of the bearer channels, with a downstream noise margin which is at least as large as the specified Downstream Target Noise Margin, relative to the required BER for each of the downstream bearer channels, or better. If the ATU-C fails to achieve the Downstream Minimum Data Rate for one of the bearer channels, the ATU-C will fail to initialize, and the NMS will be notified. Although the ATU-C and the line might be able to support a higher data rate, the ATU-C shall not transmit a higher data rate than what is requested for each of the bearer channels.

At showtime:

The ATU-C transmitter shall maintain the specified Downstream Minimum Data Rate for each of the bearer channels.

2 = Mode 2: AT_INIT- Rate automatically selected at startup only and does not change after that.

At startup:

The Downstream Minimum Rate parameter specifies the minimum data rate the ATU-C transmitter shall operate at for each of the bearer channels, with a downstream noise margin which is at least as large as the specified Downstream Target Noise Margin, relative to the required BER for each of the bearer channels, or better. If the ATU-C fails to achieve the Downstream Minimum Data Rate for one of the bearer channels, the ATU-C will fail to initialize, and the NMS will be notified. If the ATU-C transmitter is able to support a higher downstream data rate at initialization, the excess data rate will be distributed amongst the downstream bearer channels according to the ratio (0 to 100%) specified by the Rate Adaptation Ratio parameter for each bearer channel (adding up to 100% over all bearer channels). When the Downstream Maximum Data Rate is achieved in one of the bearer channels, then the remaining excess bit rate is assigned to the other bearer channels, still according to their relative Rate Adaptation Ratio parameters. As long as the downstream data rate is below the Downstream maximum Data Rate for one of the bearer channels, data rate increase shall take priority over transmit power reduction.

At showtime:

During showtime, no downstream data rate adaptation is allowed. The downstream data rate, which has been settled during initialization for each of the bearer channels, shall be maintained.

3 = Mode 3: DYNAMIC – Data rate is automatically selected at initialization and is continuously adapted during operation (showtime). The DYNAMIC Rate Adaptation mode is optional. All related configuration parameters are also optional.

At startup:

In Mode 3, the ATU-C shall start up as in Mode 2.

At showtime:

During showtime, rate adaptation is allowed with respect to the

Ratio Adaptation Ratio for distributing the excess data rate amongst the bearer channels (see Mode 2), and assuring that the Downstream Minimum Data Rate remains available at the required BER for each of the bearer channels, or better. The downstream data rate can vary between the Downstream Minimum Data Rate, and the Downstream Maximum Data Rate. Downstream Rate Adaptation is performed when the conditions specified for Downstream Upshift Noise Margin and Downstream Upshift Interval - or for Downstream Downshift Noise Margin and Downstream Downshift Interval - are satisfied. This means:

- For an Upshift action: Allowed when the downstream noise margin is above the Downstream Upshift Noise Margin during Downstream Minimum Time Interval for Upshift Rate Adaptation (i.e. upon RAU anomaly).
- For a Downshift action: Allowed when the downstream noise margin is below the Downstream Downshift Noise Margin during Downstream Minimum Time Interval for Downshift Rate Adaptation (i.e. upon RAD anomaly).

As long as the downstream data rate is below the Downstream Maximum Data Rate for one of the bearer channels, data rate increase shall take priority over transmit power reduction. (R, W, Set-by-create) (optional) (1 byte)

**Upstream Rate
Adaptation Mode:**

This parameter specifies the mode of operation of a rate-adaptive ATU-R in the transmit direction. The parameter is used only if the rate-adaptive functionality is supported and can take three values:

- 1 = MANUAL
- 2 = AT_INIT
- 3 = DYNAMIC

The definition of each of the values is identical to their definition in the Downstream Rate Adaptation Mode (with replacing of ATU-C with ATU-R and downstream with upstream). (R, W, Set-by-create) (optional) (1 byte)

**Downstream Up-shift
Noise Margin:**

If the downstream noise margin is above the Downstream Upshift Noise Margin and stays above that for more than the time specified by the Downstream Minimum Upshift Rate Adaptation Interval, the ATU-R shall attempt to increase the downstream net data rate. The Downstream Up-shift Noise Margin ranges from 0 to 31 dB with 0.1 dB steps. (R, W, Set-by-create) (optional) (2 bytes)

**Upstream Up-shift
Noise Margin:**

If the upstream noise margin is above the Upstream Up-shift Noise Margin and stays above that for more than the time specified by the Upstream Minimum Upshift Rate Adaptation Interval, the ATU-C shall attempt to increase the upstream net data rate. The Upstream Up-shift Noise Margin ranges from 0 to 31 dB with 0.1 dB steps. (R, W, Set-by-create) (optional) (2 bytes)

Upstream PSD Mask

This configuration parameter defines which upstream PSD mask is

Selection: enabled. This parameter is used only for annexes J and M of G.992.3/5. As only one selection parameter is defined in the MIB, the same selection value applies to all relevant modes enabled in the ATSE line configuration parameter. It ranges from 1 to 9 and selects the mask with the following definition.

| Upstream PSD mask selection value | Selected mask | |
|--------------------------------------|----------------------|----------------------|
| | Annex J of G.992.3/5 | Annex M of G.992.3/5 |
| 1 | ADLU-32 | EU-32 |
| 2 | ADLU-36 | EU-36 |
| 3 | ADLU-40 | EU-40 |
| 4 | ADLU-44 | EU-44 |
| 5 | ADLU-48 | EU-48 |
| 6 | ADLU-52 | EU-52 |
| 7 | ADLU-56 | EU-56 |
| 8 | ADLU-60 | EU-60 |
| 9 | ADLU-64 | EU-64 |

(R, W, Set-by-create) (optional) (1 bytes)

Actions

Create: Create an instance of this managed entity.
Delete: Delete an instance of this managed entity.
Get: Get one or more attributes.
Set: Set one or more attributes.

Notifications

None.

8.1.8 ADSL Line Configuration Profile Part 2

This managed entity contains part 2 of the Line Configuration Profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the Physical Path Termination Point ADSL UNI.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes)
Downstream Minimum Time Interval for Up- This parameter defines the interval of time the downstream noise margin should stay above the Downstream Up-shift Noise Margin before the

| | |
|--|---|
| shift Rate Adaptation: | ATU-R shall attempt to increase the downstream net data rate. The time interval ranges from 0 to 16383 s. (R, W, Set-by-create) (optional) (2 bytes) |
| Upstream Minimum Time Interval for Up-shift Rate Adaptation: | This parameter defines the interval of time the upstream noise margin should stay above the Upstream Up-shift Noise Margin before the ATU-C shall attempt to increase the upstream net data rate. The time interval ranges from 0 to 16383 s. (R, W, Set-by-create) (optional) (2 bytes) |
| Downstream Down-shift Noise Margin: | If the downstream noise margin is below the Downstream Down-shift Noise Margin and stays below that for more than the time specified by the Downstream Minimum Downshift Rate Adaptation Interval, the ATU-R shall attempt to decrease the downstream net data rate. The Downstream Down-shift Noise Margin ranges from 0 to 31 dB with 0.1 dB steps. (R, W, Set-by-create) (optional) (2 bytes) |
| Upstream Down-shift Noise Margin: | If the upstream noise margin is below the Upstream Down-shift Noise Margin and stays below that for more than the time specified by the Upstream Minimum Downshift Rate Adaptation Interval, the ATU-C shall attempt to decrease the upstream net data rate. The Upstream Down-shift Noise Margin ranges from 0 to 31 dB with 0.1 dB steps. (R, W, Set-by-create) (optional) (2 bytes) |
| Downstream Minimum Time Interval for Downshift Rate Adaptation: | This parameter defines the interval of time the downstream noise margin should stay below the Downstream Down-shift Noise Margin before the ATU-R shall attempt to decrease the downstream net data rate. The time interval ranges from 0 to 16383 s. (R, W, Set-by-create) (optional) (2 bytes) |
| Upstream Minimum Time Interval for Downshift Rate Adaptation: | This parameter defines the interval of time the upstream noise margin should stay below the Upstream Downshift Noise Margin before the ATU-C shall attempt to decrease the upstream net data rate. The time interval ranges from 0 to 16383 s. (R, W, Set-by-create) (optional) (2 bytes) |
| ATU Impedance State forced: | <p>This configuration parameter defines the impedance state to be forced on the near-end ATU. It applies only to the T/S-interface. It is coded as an integer value with following definition:</p> <ol style="list-style-type: none"> 1 Force the near-end ATU to the disabled state. 2 Force the near-end ATU to the inactive state. 3 Force the near-end ATU to the active state. <p>(R, W, Set-by-create) (optional) (1 byte)</p> |
| L0-TIME: | This parameter represents the minimum time (in seconds) between an Exit from the L2 state and the next Entry into the L2 state. It ranges from 0 to 255 seconds. (R, W, Set-by-create) (optional) (1 byte) |
| L2-TIME: | This parameter represents the minimum time (in seconds) between an Entry into the L2 state and the first Power Trim in the L2 state and between two consecutive Power Trims in the L2 State. It ranges from 0 to 255 seconds. (R, W, Set-by-create) (optional) (1 byte) |
| L2-ATPR: | This parameter represents the maximum aggregate transmit power reduction (in dB) that can be performed in the L2 Request (i.e. at transition of L0 to L2 state) or through a single Power Trim in the L2 state. It ranges from 0 dB to 31 dB (R, W, Set-by-create) (optional) (1 byte) |

| | |
|---|---|
| Loop Diagnostics Mode Forced: | <p>This configuration parameter defines whether the line should be forced into the loop diagnostics mode by the near-end ATU on this line. It is coded as an integer value with following definition:</p> <ol style="list-style-type: none">0 Inhibits the near-end ATU from performing loop diagnostics mode procedures on the line. Loop diagnostic mode procedures may still be initiated by the far-end ATU.1 Forces the near-end ATU to perform the loop diagnostics procedures. <p>The line needs to be forced to the L3 state before it can be forced to the loop diagnostics mode. Only while the line power management state is the L3 state, the line can be forced into the loop diagnostics mode procedures. When the loop diagnostics mode procedures are completed successfully, the Access Node shall reset the LDSF MIB element to 0 and the line shall returns to remain in the L3 idle state. The loop diagnostics data shall be available at least until the line is forced to the L0 state. If the loop diagnostics procedures cannot be completed successfully, (after a vendor discretionary number of retries and/or within a vendor discretionary timeout), then an Initialization Failure occurs. As long as loop diagnostics procedures are not completed successfully, attempts shall be made to do so, until the loop diagnostics mode is no longer forced on the line through this configuration parameter. (R, W, Set-by-create) (optional) (1 byte)</p> |
| Downstream Maximum Nominal Power Spectral Density: | <p>This parameter represents the maximum nominal transmit PSD in the downstream direction during initialization and showtime (in dBm/Hz). A single MAXNOMPSDs parameter is defined per mode enabled in the ATSE line configuration parameter. It ranges from -60 to -40-30 dBm/Hz, with 0.1 dB steps. (R, W, Set-by-create) (optional) (1 byte)</p> |
| Upstream Maximum Nominal Power Spectral Density: | <p>This parameter represents the maximum nominal transmit PSD in the upstream direction during initialization and showtime (in dBm/Hz). A single MAXNOMPSDus parameter is defined per mode enabled in the ATSE line configuration parameter. It ranges from -60 to -38-30 dBm/Hz, with 0.1 dB steps. (R, W, Set-by-create) (optional) (1 byte)</p> |
| Downstream Maximum Nominal Aggregate Transmit Power: | <p>This parameter represents the maximum nominal aggregate transmit power in the downstream direction during initialization and showtime (in dBm). It ranges from 0 to 25.5 dBm, with 0.1 dB steps. (R, W, Set-by-create) (optional) (1 byte)</p> |
| Upstream Maximum Nominal Aggregate Transmit Power: | <p>This parameter represents the maximum nominal aggregate transmit power in the upstream direction during initialization and showtime (in dBm). It ranges from 0 to 25.5 dBm, with 0.1 dB steps. (R, W, Set-by-create) (optional) (1 byte)</p> |

Actions

| | |
|----------------|--|
| Create: | Create an instance of this managed entity. |
| Delete: | Delete an instance of this managed entity. |
| Get: | Get one or more attributes. |
| Set: | Set one or more attributes. |

Notifications

None.

8.1.9 ADSL Line Configuration Profile Part 3

This managed entity contains part 3 of the Line Configuration Profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the Physical Path Termination Point ADSL UNI.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes)

Upstream Maximum Aggregate Receive Power: This parameter represents the maximum upstream aggregate receive power over a set of subcarriers (in dBm) as specified in the relevant recommendation. The ATU-C shall request an upstream power cutback such that the upstream aggregate receive power over that set of subcarriers is at or below the configured maximum value. It ranges from -25.5 to 25.5 dBm, with 0.1 dB steps. A special value 0 of 0xFFFF is used to indicate that no Upstream Maximum Aggregate Receive Power limit is to be applied. (R) (optional) (2 bytes)

Downstream Rate Adaptation Mode: This parameter specifies the mode of operation of a rate-adaptive ATU-C in the transmit direction. The parameter is can take three values.

Mode 1: MANUAL - Rate changed manually.

At startup:

The Downstream Minimum Data Rate parameter specifies the data rate the ATU-C transmitter shall operate at for each of the bearer channels, with a downstream noise margin which is at least as large as the specified Downstream Target Noise Margin, relative to the required BER for each of the downstream bearer channels, or better. If the ATU-C fails to achieve the Downstream Minimum Data Rate for one of the bearer channels, the ATU-C will fail to initialize, and the NMS will be notified. Although the ATU-C and the line might be able to support a higher data rate, the ATU-C shall not transmit a higher data rate than what is requested for each of the bearer channels.

At showtime:

The ATU-C transmitter shall maintain the specified Downstream Minimum Data Rate for each of the bearer channels.

Mode 2: AT_INIT- Rate automatically selected at startup only and does

not change after that.

At startup:

The Downstream Minimum Rate parameter specifies the minimum data rate the ATU-C transmitter shall operate at for each of the bearer channels, with a downstream noise margin which is at least as large as the specified Downstream Target Noise Margin, relative to the required BER for each of the bearer channels, or better. If the ATU-C fails to achieve the Downstream Minimum Data Rate for one of the bearer channels, the ATU-C will fail to initialize, and the NMS will be notified. If the ATU-C transmitter is able to support a higher downstream data rate at initialization, the excess data rate will be distributed amongst the downstream bearer channels according to the ratio (0 to 100%) specified by the Rate Adaptation Ratio parameter for each bearer channel (adding up to 100% over all bearer channels). When the Downstream Maximum Data Rate is achieved in one of the bearer channels, then the remaining excess bit rate is assigned to the other bearer channels, still according to their relative Rate Adaptation Ratio parameters. As long as the downstream data rate is below the Downstream maximum Data Rate for one of the bearer channels, data rate increase shall take priority over transmit power reduction.

At showtime:

During showtime, no downstream data rate adaptation is allowed. The downstream data rate, which has been settled during initialization for each of the bearer channels, shall be maintained.

Mode 3: DYNAMIC – Data rate is automatically selected at initialization and is continuously adapted during operation (showtime). The DYNAMIC Rate Adaptation mode is optional. All related configuration parameters are also optional.

At startup:

In Mode 3, the ATU-C shall start up as in Mode 2.

At showtime:

During showtime, rate adaptation is allowed with respect to the Ratio Adaptation Ratio for distributing the excess data rate amongst the bearer channels (see Mode 2), and assuring that the Downstream Minimum Data Rate remains available at the required BER for each of the bearer channels, or better. The downstream data rate can vary between the Downstream Minimum Data Rate, and the Downstream Maximum Data Rate. Downstream Rate Adaptation is performed when the conditions specified for Downstream Upshift Noise Margin and Downstream Upshift Interval - or for Downstream Downshift Noise Margin and Downstream Downshift Interval - are satisfied. This means:

- For an Upshift action: Allowed when the downstream noise margin is above the Downstream Upshift Noise Margin during Downstream Minimum Time Interval for Upshift Rate Adaptation (i.e. upon RAU anomaly).
- For a Downshift action: Allowed when the downstream noise margin is below the Downstream Downshift Noise

Margin during Downstream Minimum Time Interval for Downshift Rate Adaptation (i.e. upon RAD anomaly).

As long as the downstream data rate is below the Downstream Maximum Data Rate for one of the bearer channels, data rate increase shall take priority over transmit power reduction. (R) (optional) (1byte)

Upstream Rate Adaptation Mode:

This parameter specifies the mode of operation of a rate-adaptive ATU-R in the transmit direction. The parameter is used only if the rate-adaptive functionality is supported and can take three values (MANUAL, AT_INIT, DYNAMIC). The definition of each of the values is identical to their definition in the Downstream Rate Adaptation Mode (with replacing of ATU-C with ATU-R and downstream with upstream). (R) (optional) (1 byte)

Downstream Up-shift Noise Margin:

If the downstream noise margin is above the Downstream Upshift Noise Margin and stays above that for more than the time specified by the Downstream Minimum Up shift Rate Adaptation Interval, the ATU-R shall attempt to increase the downstream net data rate. The Downstream Up-shift Noise Margin ranges from 0 to 31 dB with 0.1 dB steps. (R) (optional) (2 bytes)

Upstream Up-shift Noise Margin:

If the upstream noise margin is above the Upstream Up-shift Noise Margin and stays above that for more than the time specified by the Upstream Minimum Up shift Rate Adaptation Interval, the ATU-C shall attempt to increase the upstream net data rate. The Upstream Up-shift Noise Margin ranges from 0 to 31 dB with 0.1 dB steps. (R) (optional) (2 bytes)

Actions

| | |
|----------------|--|
| Create: | Create an instance of this managed entity. |
| Delete: | Delete an instance of this managed entity. |
| Get: | Get one or more attributes. |
| Set: | Set one or more attributes. |

Notifications

None.

8.1.10 ADSL Channel Configuration Profile

This managed entity contains the Channel Configuration Profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the Physical Path Termination Point ADSL UNI.

Attributes

| | |
|--|---|
| Managed Entity id: | This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes) |
| Minimum Data Rate: | This parameter specifies the minimum net data rate for the bearer channel as desired by the operator of the system. The rate is coded in bit/s. (R) (optional) (4 bytes) |
| Maximum Data Rate: | This parameter specifies the maximum net data rate for the bearer channel as desired by the operator of the system. The data rate is coded in bit/s. (R) (optional) (4 bytes) |
| Rate Adaptation Ratio: | <p>This parameter (expressed in %) specifies the ratio that should be taken into account for the bearer channel when performing rate adaptation in the direction of the bearer channel. The ratio is defined as a percentage in the 0 to 100 range. A ratio of 20% means that 20% of the available data rate (in excess of the Minimum Data Rate summed over all bearer channels) will be assigned to this bearer channel and 80% to the other bearer channels.</p> <p>The sum of rate adaption ratios over all bearers in one direction shall be equal to 100 %. (R) (optional) (1 byte)</p> |
| Maximum Interleaving Delay: | <p>This parameter is the maximum one-way interleaving delay introduced by the PMS-TC between the alfa and the beta reference points, in the direction of the bearer channel.. The one-way interleaving delay is defined in individual ADSL Recommendations as $\lceil S \cdot D \rceil / 4$ ms, where "S" is the S-factor and "D" is the "Interleaving Depth" and $\lceil x \rceil$ denotes rounding to the higher integer.</p> <p>The ATUs shall choose the S and D values such that the actual one-way interleaving delay is less or equal than the configured Maximum Interleaving Delay. The delay is coded in ms, with the value 0 and 1 special values. The value 0 indicates no delay bound is being imposed. The value 1 indicates the Fast Latency Path shall be used in the G.992.1 operating mode and S and D shall be selected such that $S \leq 1$ and $D = 1$ in G.992.2, G.992.3 and G.992.4 operating modes. (R) (optional) (1 bytes)</p> |
| Data Rate Threshold Up-shift: | This parameter is a threshold on the net data rate up-shift achieved over one or more bearer channel data rate adaptations. An up-shift rate change alarm (event) is triggered when the actual data rate exceeds the data rate at the last entry into showtime by more than the threshold. The data rate threshold is coded in bit/s. (R) (optional) (4 bytes) |
| Data Rate Threshold Down-shift: | This parameter is a threshold on the net data rate down-shift achieved over one or more bearer channel data rate adaptations. A down-shift rate change alarm (event) is triggered when the actual data rate is below the data rate at the last entry into showtime by more than the threshold. The data rate threshold is coded in bit/s. (R) (optional) (4 bytes) |
| Minimum Reserved Data Rate: | This parameter specifies the minimum net data rate for the bearer channel as desired by the operator of the system. The rate is coded in bit/s. (R) (optional) (4 bytes) |
| Minimum Data Rate in low power state: | This parameter specifies the minimum net data rate for the bearer channel as desired by the operator of the system during the low power state |

(L1/L2). The power management low power states L1 and L2 are defined in G.992.2 and G.992.3 respectively. The data rate is coded in bit/s. (R) (optional) (4 byte)

Minimum Impulse Noise Protection:

This parameter specifies the minimum impulse noise protection for the bearer channel. The impulse noise protection is expressed in symbols and can take the following integer values:

1 = 0 symbols

2 = ½ symbols

3 = 1 symbols

4 = 2 symbols

(R) (optional) (1 byte)

Maximum Bit Error Ratio:

This parameter specifies the maximum bit error ratio for the bearer channel as desired by the operator of the system. The bit error ratio can take the following integer values:

1 = 1E-3

2 = 1E-5

3 = 1E-7

(R) (optional) (1 bytes)

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

8.1.11 ADSL Subcarrier Masking Downstream Profile

This managed entity contains Subcarrier Masking Downstream Profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the Physical Path Termination Point ADSL UNI.

Attributes

| | |
|------------------------------------|--|
| Managed Entity id: | This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes) |
| Downstream Subcarrier Mask: | <p>This configuration parameter is an array of boolean values sc(i). Each entry sc(i) defines whether subcarrier index i is masked on this line in the downstream direction, for i ranging from 0 to NSCds-1. It is coded as 1 if masked and 0 if not masked. This parameter only applies to the Q-interface.</p> <p>NSCds is the higher subcarrier that can be transmitted in the downstream direction. For G.992.3 and G.992.4, it is defined in the corresponding recommendations. For G.992.1, NSCds = 256 and for G.992.2, NSCds = 128. (R, W) (optional) (512 bytes)</p> |

Actions

| | |
|------------------|--|
| Get: | Get one or more attributes. Latch a snapshot (i.e. copy) of the current Downstream Subcarrier Mask and respond with the size of data (4 bytes), which should be obtained using the "Get next" command. |
| Get next: | Get the latched attribute values of the managed entity within the current snapshot. |
| Set: | Set one or more attributes. |

Notifications

None.

8.1.12 ADSL Subcarrier Masking Upstream Profile

This managed entity contains Subcarrier Masking Upstream Profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the Physical Path Termination Point ADSL UNI.

Attributes

| | |
|----------------------------------|---|
| Managed Entity id: | This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes) |
| Upstream Subcarrier Mask: | This configuration parameter is an array of boolean values sc(i). Each entry sc(i) defines whether transmission of subcarrier index i is allowed on this line in the upstream direction, for i ranging from 0 to NSCus-1. It is coded as 0 if not allowed and 1 if allowed. This parameter only applies |

to the Q-interface.

NSCus is the higher subcarrier that can be transmitted in the upstream direction. For G.992.3 and G.992.4, it is defined in the corresponding recommendation. For G.992.1 Annex A and G.992.2, NSCus = 32 and for G.992.1 Annex B, NSCus = 64. (R) (optional) (64 bytes)

Actions

- Get:** Get one or more attributes. Latch a snapshot (i.e. copy) of the current Upstream Subcarrier Mask and respond with the size of data (4 bytes), which should be obtained using the "Get next" command.
- Get next:** Get the latched attribute values of the managed entity within the current snapshot.
- Set:** Set one or more attributes.

Notifications

None.

8.1.13 ADSL Downstream PSD Mask Profile

This managed entity contains Downstream PSD Mask Profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the Physical Path Termination Point ADSL UNI.

Attributes

- Managed Entity id:** This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes)
- Downstream PSD Mask:** This configuration parameter defines the downstream PSD mask applicable at the U-C2 reference point. This MIB PSD mask may impose PSD restrictions in addition to the Limit PSD mask defined in the relevant Recommendation (e.g., G.992.5).
- The downstream PSD mask in the CO-MIB shall be specified through a set of breakpoints. Each breakpoint shall consist of a subcarrier index t and a MIB PSD mask level (expressed in dBm/Hz) at that subcarrier. The set of breakpoints can then be represented as $[(t_1, \text{PSD}_1), (t_2, \text{PSD}_2), \dots, (t_N, \text{PSD}_N)]$. The subcarrier index shall be coded as an unsigned integer. The MIB PSD mask level shall be coded as an unsigned integer representing the MIB PSD mask levels 0 dBm/Hz (coded as 0) to -95 dBm/Hz (coded as 255), in steps of 0.5 dBm/Hz. The maximum number of breakpoints is 32.

The requirements for a valid set of breakpoints are defined in the relevant Recommendations (e.g., G.992.5). (R, W) (optional) (64 bytes)

Actions

- Get:** Get one or more attributes. Latch a snapshot (i.e. copy) of the current Downstream PSD Mask and respond with the size of data (4 bytes), which should be obtained using the "Get next" command.
- Get next:** Get the latched attribute values of the managed entity within the current snapshot.
- Set:** Set one or more attributes.

Notifications

None.

8.1.14 ADSL Downstream RFI Bands Profile

This managed entity contains Downstream RFI Bands Profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the Physical Path Termination Point ADSL UNI.

Attributes

- Managed Entity id:** This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes)
- Downstream RFI Bands:** This configuration parameter defines the subset of downstream RFI Bands breakpoints, as specified in Downstream PSD Mask ME, that shall be used to notch an RFI band. This subset consists of couples of consecutive subcarrier indices belonging to breakpoints: $[ti; ti+1]$, corresponding to the low level of the notch.
- The specific interpolation around these points is defined in the relevant Recommendations (e.g. G.992.5).
- The CO-MIB shall define the RFI notches using breakpoints in the Downstream PSD Mask ME as specified in the relevant Recommendations (e.g. G.992.5).
- (R, W) (optional) (64 bytes)

Actions

- Get:** Get one or more attributes. Latch a snapshot (i.e. copy) of the current Downstream RFI Bands and respond with the size of data (4 bytes), which should be obtained using the "Get next" command.
- Get next:** Get the latched attribute values of the managed entity within the current snapshot.
- Set:** Set one or more attributes.

Notifications

None.

8.1.15 ADSL ATU-C Performance Monitoring History Data

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATUC – ATUR ADSL modem path as seen from the ATUC.

Instances of this managed entity are created/deleted by the OLT after an instance of the *corresponding Physical Path Termination Point ADSL UNI managed entity* is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of a Physical Path Termination Point ADSL UNI.

Attributes

- Managed Entity id:** This attribute provides a unique number for each instance of this managed entity. The assigned number is the same as the id of the Physical Path Termination Point ADSL UNI with which this ATU-C Performance Monitoring History Data is associated. (R) (mandatory) (2 bytes)
- Interval End Time:** This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 during the first period after this, and so on. If this managed entity is created after the reception of the "synchronize time" action, the value of this attribute set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. (R) (mandatory) (1 byte)
- Threshold DataB-PON id:** This attribute provides a pointer to an instance of the Threshold DataB-PON managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, Set by-create) (mandatory) (2 bytes)
- Loss of Frame Seconds:** This attribute is the count of seconds in the previous 15 minute interval when there was Loss of Framing. (R) (optional) (2 bytes)

| | |
|----------------------------------|--|
| Loss of Signal Seconds: | This attribute is the count of seconds in the previous 15 minute interval when there was Loss of Signal. (R) (optional) (2 bytes) |
| Loss of Link Seconds: | This attribute is the count of seconds in the previous 15 minute interval when there was Loss of Link. (R) (optional) (2 bytes) |
| Loss of Power Seconds: | This attribute is the count of seconds in the previous 15 minute interval when there was Loss of Power. (R) (optional) (2 bytes) |
| Errored Seconds: | This attribute is the count of Errored Seconds in the previous 15 minute interval. (R) (optional) (2 bytes) |
| Severely Errored Seconds: | This attribute is the count of Severely Errored Seconds in the previous 15 minute interval. (R) (optional) (2 bytes) |
| Line Initializations: | This attribute is the count of Line Initializations in the previous 15 minute interval. (R) (optional) (2 bytes) |
| Fast Retrain | This attribute is the number of seconds in the previous 15 minutes during which there have been fast retrains. (R) (optional) (2 bytes) |
| Failed Fast Retrain | This attribute is the number of seconds in the previous 15 minutes during which there have been failed fast retrains. (R) (optional) (2 bytes) |

Actions

| | |
|-------------------------|--|
| Create: | Create an instance of this managed entity. |
| Delete: | Delete an instance of this managed entity. |
| Get: | Get one or more attributes. |
| Get Current Data | Get the current value of one or more attributes. |
| Set: | Set one or more attributes. |

Notifications

| | |
|----------------------------------|--|
| Threshold Crossing Alert: | This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 5/G.omci.xdsl. |
|----------------------------------|--|

Table 5/G.omci.xdsl ADSL Performance Monitoring History Data

| Number | Event | Description |
|--------|--------------------------|---|
| | Threshold Crossing Alert | |
| 0 | Loss of Frame Seconds | Loss of Frame Seconds threshold crossing |
| 1 | Loss of Signal Seconds | Loss of Signal Seconds threshold crossing |
| 2 | Loss of Link Seconds | Loss of Link Seconds threshold crossing |
| 3 | Loss of Power Seconds | Loss of Power seconds threshold crossing |
| 4 | Errored Seconds | Errored seconds threshold crossing |
| 5 | Severely Errored Seconds | Severely Errored seconds threshold |

| | | |
|---|----------------------|---|
| | | crossing |
| 6 | Line Initializations | Line Initializations threshold crossing |
| 7 | Fast Retrain | Fast Retrain threshold crossing |
| 8 | Failed Fast Retrain | Failed Fast Retrain threshold crossing |

8.1.16 ADSL ATU-R Performance Monitoring History Data

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATUC - ATUR ADSL modem path as seen from the ATUR.

Instances of this managed entity are created/deleted by the OLT after an instance of the *corresponding Physical Path Termination Point ADSL UNI managed entity* is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of a Physical Path Termination Point ADSL UNI.

Attributes

- Managed Entity id:** This attribute provides a unique number for each instance of this managed entity. The assigned number is the same as the id of the Physical Path Termination Point ADSL UNI with which this ATU-R Performance Monitoring History Data is associated. (R, Set-by-create) (mandatory) (2 bytes)
- Interval End Time:** This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 during the first period after this, and so on. If this managed entity is created after the reception of the "synchronize time" action, the value of this attribute set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. (R) (mandatory) (1 byte)
- Threshold DataB-PON id:** This attribute provides a pointer to an instance of the Threshold DataB-PON managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, Set by-create) (mandatory) (2 bytes)
- Loss of Frame Seconds:** This attribute is the count of seconds in the previous 15 minute interval when there was Loss of Framing. (R) (optional) (2 bytes)
- Loss of Signal Seconds:** This attribute is the count of seconds in the previous 15 minute interval when there was Loss of Signal. (R) (optional) (2 bytes)
- Loss of Power Seconds:** This attribute is the count of seconds in the previous 15 minute interval when there was Loss of Power. (R) (optional) (2 bytes)
- Errored Seconds:** This attribute is the count of Errored Seconds in the previous 15 minute interval. (R) (optional) (2 bytes)

Severely Errored Seconds: This attribute is the count of Severely Errored Seconds in the previous 15 minute interval. (R) (optional) (2 bytes)

Actions

Create: Create an instance of this managed entity.
Delete: Delete an instance of this managed entity.
Get: Get one or more attributes.
Get Current Data Get the current value of one or more attributes.
Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 6/G.omci.xdsl.

Table 6/G.omci.xdsl ATU-R Performance Monitoring History Data

| Number | Event | Description |
|--------|--------------------------|---|
| | Threshold Crossing Alert | |
| 0 | Loss of Frame Seconds | Loss of Frame Seconds threshold crossing |
| 1 | Loss of Signal Seconds | Loss of Signal Seconds threshold crossing |
| 2 | Loss of Power Seconds | Loss of Power seconds threshold crossing |
| 3 | Errored Seconds | Errored seconds threshold crossing |
| 4 | Severely Errored Seconds | Severely Errored seconds threshold crossing |

8.1.17 ADSL ATU-C Channel Performance Monitoring History Data

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATUC - ATUR ADSL channel as seen from the ATUC.

Instances of this managed entity are created/deleted by the OLT after an instance of the *corresponding Physical Path Termination Point ADSL UNI managed entity* is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of a Physical Path Termination Point ADSL UNI.

Attributes

| | |
|--------------------------------|---|
| Managed Entity id: | This attribute provides a unique number for each instance of this managed entity. The assigned number is the same as the id of the Physical Path Termination Point ADSL UNI with which this ATU-C Channel Performance Monitoring History Data is associated. (R, Set-by-create) (mandatory) (2 bytes) |
| Interval End Time: | This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 during the first period after this, and so on. If this managed entity is created after the reception of the "synchronize time" action, the value of this attribute set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. (R) (mandatory) (1 byte) |
| Threshold DataB-PON id: | This attribute provides a pointer to an instance of the Threshold DataB-PON managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, Set by-create) (mandatory) (2 bytes) |
| Corrected blocks: | This attribute is the count of all blocks received with errors that were corrected on this channel within the previous 15 minute interval. (R) (optional) (4 bytes) |
| Uncorrected Blocks: | This attribute is the count of all blocks received with uncorrectable errors on this channel within the previous 15 minute interval. (R) (optional) (4 bytes) |
| Transmitted Blocks: | This attribute is the count of all encoded blocks transmitted on this channel within the previous 15 minute interval. (R) (optional) (4 bytes) |
| Received Blocks: | This attribute is the count of all encoded blocks received on this channel within the previous 15 minute interval. (R) (optional) (4 bytes) |

Actions

| | |
|-------------------------|--|
| Create: | Create an instance of this managed entity. |
| Delete: | Delete an instance of this managed entity. |
| Get: | Get one or more attributes. |
| Get Current Data | Get the current value of one or more attributes. |
| Set: | Set one or more attributes. |

Notifications

| | |
|----------------------------------|--|
| Threshold Crossing Alert: | This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 7/G.omci.xdsl. |
|----------------------------------|--|

Table 7/G.omci.xdsl ATUC Channel Performance Monitoring History Data

| Number | Event | Description |
|--------|--------------------------|---------------------------------------|
| | Threshold Crossing Alert | |
| 0 | Corrected Blocks | Corrected Blocks threshold crossing |
| 1 | Uncorrected Blocks | Uncorrected Blocks threshold crossing |

8.1.18 ADSL ATU-R Channel Performance Monitoring History Data

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATUC - ATUR ADSL channel as seen from the ATUR.

Instances of this managed entity are created/deleted by the OLT after an instance of the *corresponding Physical Path Termination Point ADSL UNI managed entity* is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of a Physical Path Termination Point ADSL UNI.

Attributes

| | |
|--------------------------------|---|
| Managed Entity id: | This attribute provides a unique number for each instance of this managed entity. The assigned number is the same as the id of the Physical Path Termination Point ADSL UNI with which this ATU-R Channel Performance Monitoring History Data is associated. (R, Set-by-create) (mandatory) (2 bytes) |
| Interval End Time: | This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 during the first period after this, and so on. If this managed entity is created after the reception of the "synchronize time" action, the value of this attribute set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. (R) (mandatory) (1 byte) |
| Threshold DataB-PON id: | This attribute provides a pointer to an instance of the Threshold DataB-PON managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R) (mandatory) (optional)(2 bytes) |
| Corrected blocks: | This attribute is the count of all blocks received with errors that were corrected on this channel within the previous 15 minute interval. (R)(optional) (4 bytes) |
| Uncorrected Blocks: | This attribute is the count of all blocks received with uncorrectable errors on this channel within the previous 15 minute interval. (R)(optional) (4 bytes) |

Transmitted Blocks: This attribute is the count of all encoded blocks transmitted on this channel within the previous 15 minute interval. (R) (optional) (4 bytes)

Received Blocks: This attribute is the count of all encoded blocks received on this channel within the previous 15 minute interval. (R) (optional) (4 bytes)

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get Current Data Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 8/G.omci.xdsl.

Table 8/G.omci.xdsl ATU-R Channel Performance Monitoring History Data

| Number | Event | Description |
|--------|--------------------------|---------------------------------------|
| | Threshold Crossing Alert | |
| 0 | Corrected Blocks | Corrected Blocks threshold crossing |
| 1 | Uncorrected Blocks | Uncorrected Blocks threshold crossing |

8.1.19 TC Adaptor Performance Monitoring History Data ADSL

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATUC - ATUR ATM Data Path.

Instances of this managed entity are created/deleted by the OLT after an instance of the *corresponding Physical Path Termination Point ADSL UNI managed entity* is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of a Physical Path Termination Point ADSL UNI.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed

entity. The assigned number is the same as the id of the Physical Path Termination Point ADSL UNI with which this ATU-R Channel Performance Monitoring History Data is associated. (R, Set-by-create) (mandatory) (2 bytes)

| | |
|---|---|
| Interval End Time: | This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 during the first period after this, and so on. If this managed entity is created after the reception of the "synchronize time" action, the value of this attribute set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. (R) (mandatory) (1 byte) |
| Threshold Data_{B-PON} id: | This attribute provides a pointer to an instance of the Threshold DataB-PON managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R) (mandatory) (optional)(2 bytes) |
| Near-end HEC violation count: | The near-end HEC_violation_count performance parameter is a count of the number of occurrences of a near-end HEC anomaly in the ATM Data Path. (R) (optional) (2 bytes) |
| Near-end delineated total cell count (CD-P): | The near-end delineated_total_cell_count performance parameter is a count of the total number of cells passed through the cell delineation and HEC function process operating on the ATM Data Path while in the SYNC state. (R) (optional) (4 bytes) |
| Near-end User total cell count: | The near-end User_total_cell_count performance parameter is a count of the total number of cells in the ATM Data Path delivered at the V-C (for ATU-C) or T-R (for ATU-R) interface. (R) (optional) (4 bytes) |
| Near-end Idle Cell Bit Error Count: | The near-end idle_bit_error_count performance parameter in a count of the number of bit errors in the idle cell payload received in the ATM Data Path at the near-end. (R) (optional) (2 bytes) |
| Far-end HEC violation count: | The far-end HEC_violation_count performance parameter is a count of the number of occurrences of a far-end HEC anomaly in the ATM Data Path. (R) (optional) (2 bytes) |
| Far-end delineated total cell count: | The far-end delineated_total_cell_count performance parameter is a count of the total number of cells passed through the cell delineation process and HEC function operating on the ATM Data Path while in the SYNC state. (R) (optional) (4 bytes) |
| Far-end User total cell count: | The far-end User_total_cell_count performance parameter is a count of the total number of cells in the ATM Data Path delivered at the V-C (for ATU-C) or T-R (for ATU-R) interface. (R) (optional) (4 bytes) |
| Far-end Idle Cell Bit Error Count: | The far-end idle_bit_error_count performance parameter is a count of the number of bit errors in the idle cell payload received in the ATM Data Path at the far-end. (R) (optional) (2 bytes) |

Actions

| | |
|----------------|--|
| Create: | Create an instance of this managed entity. |
| Delete: | Delete an instance of this managed entity. |

Get: Get one or more attributes.
Get Current Data Get the current value of one or more attributes.
Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 9/G.omci.xdsl.

Table 9/G.omci.xdsl TC Adaptor Performance Monitoring History Data ADSL

| Number | Event | Description |
|--------|------------------------------------|---|
| | Threshold Crossing Alert | |
| 0 | Near-end HEC violation | Near-end HEC violation count threshold crossing |
| 1 | Near-end Idle Cell Bit Error Count | Near-end Idle Cell Bit Error Count threshold crossing |
| 2 | Far-end HEC violation count | Far-end HEC violation count threshold crossing |
| 3 | Far-end Idle Cell Bit Error Count | Far-end Idle Cell Bit Error Count threshold crossing |

8.2 VDSL

8.2.1 Physical Path Termination Point VDSL UNI

This managed entity represents the point at a VDSL connection in the ONT where physical paths terminate and physical path level functions (e.g., path overhead functions) are performed.

Instances of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of VDSL type.

If the Subscriber Line Card of VDSL type is a plug-in unit, the number of managed entities automatically created is the maximum number supportable by the Subscriber Line Card slot. This allows the creation of these managed entities before the unit is plugged-in.

Establishment of a "Physical Path Termination Point VDSL UNI"

The Physical Path Termination Point VDSL UNI is auto created when the Subscriber Line Card of type VDSL is created. On auto creation the three profile pointers within the Managed Entity are set to their default values of 0x00. However, the PPTP VDSL UNI must refer to three valid profiles before it can be operational.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as VDSL type.

Extensions for VDSL using Single Carrier Modulation (SCM) and Multiple Carrier Modulation (MCM) are for further study.

Attributes

| | |
|-------------------------------|---|
| Managed Entity id | This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot id (defined in G.983.2/Section 7.1.3). The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes) |
| Loopback Configuration | This attribute represents the loopback configuration of this physical interface. Value 0x00: no loopback; value 0x01: loopback2 ("Loopback2" refers to a loopback at the local VDSL modem). The OLT can execute a physical level loopback test after loopback is set.). Upon autonomous instantiation, the value 0x00 is used. (R, W) (optional) (1 byte) |
| Administrative State | This attribute is used to activate (unlock: value 0x00) and deactivate (lock: value 0x01) the functions performed by instances of this managed entity. Selection of a default value for this attribute is outside the scope of this document as it is normally handled through supplier-operator negotiations. (R, W) (mandatory) (1 byte) |
| Operational State | This attribute indicates whether or not this managed entity is capable of performing its task. The operational state reflects the perceived ability to receive or to generate a valid signal. Valid values are enabled (0x00) and disabled (0x01). (R) (optional) (1 byte) |
| Availability State | This attribute indicates whether the hardware to support this UNI is available on the plugged in line card. Valid values are available(0), notAvailable(1), unknown(2). (R) (optional) (1 byte) |

| | |
|--|---|
| VDSL Line Coding Type | This data type is used as the syntax for the VDSL Line Code. Attributes with this syntax identify the line coding used. The three values are: other(1) - none of the following, mcm(2) - Multiple Carrier Modulation, scm(3) - Single Carrier Modulation. (R) (optional) (1 byte) |
| VDSL Line Type | Defines the type of VDSL physical line entity that exists, by defining whether and how the line is channelized. If the line is channelized, the value will be other than noChannel(1). This object defines which channel type(s) are supported. Defined values are noChannel(1) - no channels exist, fastOnly(2) - only fast channel exists, slowOnly(3) - only slow channel exists, fastOrSlow(4) -- either fast or slow channel exist, but only one at a time, fastAndSlow(5) - both fast and slow channels exist. (R) (optional) (1 byte) |
| ARC: | This attribute is used to control alarm reporting from this managed entity. Valid values are "off" (alarm reporting allowed immediately) and "on" (alarm reporting inhibited). Upon initial installation and provisioning of the ONT, this attribute may be set to "on" or "off" for the time interval specified by "ARCInterval." Similarly, this attribute may be set to "off". If the attribute is set to "on", then alarm reporting is inhibited until this managed entity detects a valid signal for the time interval specified by "ARCInterval." The default value is ON. (R, W) (optional) (1 byte) |
| ARCInterval: | This attribute provides a provisionable length of time. Units are given in minutes. The default value is 2. (R, W) (optional) (1 byte) |
| VDSL Line Configuration Profile ID | This attribute provides a pointer to an instance of the VDSL Line Configuration Profile managed entity that contains the data necessary for initializing an VDSL MODEM. The value 0x00 is used to indicate that this ME does not point to a line configuration profile. The default value 0x00 is used when this ME is auto created. (R, W) (mandatory) (2 bytes) |
| VDSL Channel Configuration Profile ID | This attribute provides a pointer to an instance of the VDSL Channel Configuration Profile managed entity that contains the data necessary for channelizing a VDSL Connection. The value 0x00 is used to indicate that this ME does not point to a channel configuration profile. The default value 0x00 is used when this ME is auto created. (R, W) (mandatory) (2 bytes) |
| VDSL Band Plan Configuration Profile ID | This attribute provides a pointer to an instance of the VDSL Band Plan Configuration Profile managed entity that contains the data necessary to set up a VDSL Connection. The value 0x00 is used to indicate that this ME does not point to a and plan configuration profile. The default value 0x00 is used when this ME is auto created. (R, W) (mandatory) (2 bytes) |
| Actions | |
| Get | Get one or more attributes. |
| Set | Set one or more attributes. |
| Notifications | |
| Attribute value change: | This notification is used to report autonomous changes of attributes of this managed entity. The notification shall identify the attribute and its new value. The AVCs for this managed entity are given in Table 108/G.omci.xdsl |

Table 10/G.omci.xdsl AVC list for Physical Path Termination Point VDSL UNI

| Number | Attribute Value Change | Description |
|--------|------------------------|-------------------|
| 3 | OpState | Operational state |
| TBD | Reserved | |

Alarm: This notification is used to notify the management system when a failure has been detected or cleared. Both ONT and OLT should know the alarm list used by this entity. The alarms for this entity are given in Table 11/G.omci.xdsl.

Table 11/G.omci.xdsl Alarm list for Physical Path Termination Point VDSL UNI

| Number | Alarm | Description |
|--------|---------|---|
| 0 | NE_LOF | Near End (VTU-O) Loss of Framing |
| 1 | NE_LOS | Near End (VTU-O) Loss of Signal |
| 2 | NE_LOP | Near End (VTU-O) Loss of Power |
| 3 | NE_LOSQ | Near End (VTU-O) Loss of Signal Quality |
| 4 | NE_LOL | Near End (VTU-O) Loss of Link |
| 5 | FE_LOF | Far End (VTU-R) Loss of Framing |
| 6 | FE_LOS | Far End (VTU-R) Loss of Signal |
| 7 | FE_LOP | Far End (VTU-R) Loss of Power |
| 8 | FE_LOSQ | Far End (VTU-R) Loss of Signal Quality |

8.2.2 VDSL VTU-O Physical Data

This managed entity represents the physical status of the VDSL Termination Unit (ONU) (VTU-O) in a VDSL connection in the ONT.

An instance of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of VDSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as VDSL type.

Attributes

| | |
|---------------------------|---|
| Managed Entity ID | This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot id. The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes) |
| Line Transmit Rate | Indicates the current Vtu-O line transmit rate in kbps. This value will be less than or equal to the current attainable rate. Note: 1 kbps = 1000 bps. (R) |

| | |
|-------------------------------------|--|
| | (optional) (4 bytes) |
| Serial Number | The vendor specific string that identifies the vendor equipment. (R) (optional) (32 bytes) |
| Vendor ID | The vendor ID code is a copy of the binary vendor identification field expressed as readable characters in hexadecimal notation. (R) (optional) (16 bytes) |
| Version Number | The vendor specific version number sent by this Vtu as part of the initialization messages. It is a copy of the binary version number field expressed as readable characters in hexadecimal notation. (R) (optional) (16 bytes) |
| Current Status | Indicates current state of the VTU-O. This is a bit-map of possible conditions. The various bit positions are 0 – noDefect – There are no defects on the line. 1 – lossOfFraming – VTU-O failure due to not receiving a valid frame. 2 – lossOfSignal – VTU-O failure due to not receiving signal. 3 – lossOfPower – VTU-O failure due to loss of power. 4 – lossOfSignalQuality – Loss of Signal Quality is declared when the Noise Margin falls below the Minimum Noise Margin, or the bit-error-rate exceeds 10^{-7} . 5 – lossOfLink – VTU-O failure due to inability to link with peer Vtu. Set whenever the transceiver is in the 'Warm Start' state. 6 – dataInitFailure – VTU-O failure during initialization due to bit errors corrupting startup exchange data. 7 – configInitFailure – VTU-O failure during initialization due to peer Vtu not able to support requested configuration. 8 – protocolInitFailure – VTU-O failure during initialization due to incompatible protocol used by the peer Vtu. 9 – noPeerVtuPresent – VTU-O failure during initialization due to no activation sequence detected from peer Vtu. (R) (optional) (2 bytes) |
| Current Output Power | Measured total output power transmitted by this VTU in steps of 0.1 dBm. This is the measurement that was reported during the last activation sequence. The effective range is 0 (0) to +16 (160) dBm. (R) (optional) (1 byte) |
| Current SNR Margin | Noise Margin as seen by this Vtu with respect to its received signal in steps of 0.25dB. The effective range is -31.75 (-127) to +31.75 (127) dB. (R) (optional) (1 byte) |
| Current Attenuation | Measured difference in the total power transmitted by the peer Vtu and the total power received by this Vtu. The effective range is 0 (0) to +63.75 (255) dB. (R) (optional) (1 byte) |
| Current Attainable Rate | Indicates the maximum currently attainable line transmit rate by the Vtu-O in kbps. This value will be equal to or greater than the current line rate. Note: 1 kbps = 1000 bps. (R) (optional) (4 bytes) |
| Current Loop Length Estimate | Estimated loop length in feet assuming a 26 AWG (0.4 mm) loop. (R) (optional) (2 bytes) |

Actions

Get Get one or more attributes.

Notifications

None.

8.2.3 VDSL VTU-R Physical Data

This managed entity represents the physical status of the VDSL Termination Unit (Remote) (VTU-R) in a VDSL connection in the ONT.

An instance of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of VDSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as VDSL type.

Attributes

| | |
|---------------------------|---|
| Managed Entity ID | This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot id. The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes) |
| Line Transmit Rate | Indicates the current Vtu-R line transmit rate in kbps. This value will be less than or equal to the current attainable rate. Note: 1 kbps = 1000 bps. (R) (optional) (4 bytes) |
| Serial Number | The vendor specific string that identifies the vendor equipment. (R) (optional) (32 bytes) |
| Vendor ID | The vendor ID code is a copy of the binary vendor identification field expressed as readable characters in hexadecimal notation. (R) (optional) (16 bytes) |
| Version Number | The vendor specific version number sent by this Vtu as part of the initialization messages. It is a copy of the binary version number field expressed as readable characters in hexadecimal notation. (R) (optional) (16 bytes) |
| Current Status | Indicates current state of the Vtu line. This is a bit-map of possible conditions. The various bit positions are 0 – noDefect – There are no defects on the line. 1 – lossOfFraming – Vtu failure due to not receiving a valid frame. 2 – lossOfSignal – Vtu failure due to not receiving signal. 3 – lossOfPower – Vtu failure due to loss of power. 4 – lossOfSignalQuality – Loss of Signal Quality is declared when the Noise Margin falls below the Minimum Noise Margin, or the bit-error-rate exceeds |

10^{-7} .

(R) (optional) (1 bytes)

| | |
|--------------------------------|--|
| Current Output Power | Measured total output power transmitted by this VTU in steps of 0.1 dBm. This is the measurement that was reported during the last activation sequence. The effective range is 0 (0) to +16 (160) dBm. (R) (optional) (1 byte) |
| Current SNR Margin | Noise Margin as seen by this Vtu with respect to its received signal in 0.25dB. The effective range is -31.75 (-127) to +31.75 (127) dB. (R) (optional) (1 byte) |
| Current Attenuation | Measured difference in the total power transmitted by the peer Vtu and the total power received by this Vtu. The effective range is 0 (0) to +63.75 (255) dB. (R) (optional) (1 byte) |
| Current Attainable Rate | Indicates the maximum currently attainable line transmit rate by the Vtu-R in kbps. This value will be equal to or greater than the current line rate. Note: 1 kbps = 1000 bps. (R) (optional) (4 bytes) |

Actions

Get Get one or more attributes.

Notifications

None.

8.2.4 VDSL Channel Data

This managed entity represents the physical status of the VDSL Fast and slow channels in a VDSL connection in the ONT.

An instance of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card of VDSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as VDSL type.

Attributes

| | |
|--------------------------------------|---|
| Managed Entity ID | This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot id. The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes) |
| Current Interleave Delay Down | Downstream Interleave Delay for this channel in milliseconds. Interleave delay defines the mapping (relative spacing) between subsequent input bytes at the interleaver input and their placement in the bit stream at the interleaver |

output. Larger numbers provide greater separation between consecutive input bytes in the output bit stream allowing for improved impulse noise immunity at the expense of payload latency. (R) (optional) (1 byte)

| | |
|---|--|
| Current Fast Payload Rate Down | Actual fast channel downstream data rate, in kbps. Note: 1 kbps = 1000 bps (R) (optional) (4 bytes) |
| Current Slow Payload Rate Down | Actual slow downstream data rate, in kbps. Note: 1 kbps = 1000 bps (R) (optional) (4 bytes) |
| Current Fast CRC Block Length Down | Indicates the length of the downstream fast channel data-block, in bytes, on which the CRC operates. (R) (optional) (2 bytes) |
| Current Slow CRC Block Length Down | Indicates the length of the downstream slow channel data-block, in bytes, on which the CRC operates. (R) (optional) (2 bytes) |
| Current Slow Burst Protect Down | Actual level of downstream impulse noise (burst) protection, in microseconds, for the slow channel. (R) (optional) (2 bytes) |
| Current Fast FEC Down | Actual downstream Forward Error Correction (FEC) redundancy, in percent, related overhead for the fast channel. (R) (optional) (1 byte) |
| Current Interleave Delay Up | Downstream Interleave Delay for this channel in milliseconds. Interleave delay applies only to the interleave (slow) channel and defines the mapping (relative spacing) between subsequent input bytes at the interleaver input and their placement in the bit stream at the interleaver output. Larger numbers provide greater separation between consecutive input bytes in the output bit stream allowing for improved impulse noise immunity at the expense of payload latency. In the case where the interface type is fast, return a value of zero. (R) (optional) (1 byte) |
| Current Fast Payload Rate Up | Actual fast channel upstream data rate, in kbps. Note: 1 kbps = 1000 bps (R) (optional) (4 bytes) |
| Current Slow Payload Rate Up | Actual slow upstream data rate, in kbps. Note: 1 kbps = 1000 bps (R) (optional) (4 bytes) |
| Current Fast CRC Block Length UP | Indicates the length of the upstream fast channel data-block, in bytes, on which the CRC operates. (R) (optional) (2 bytes) |
| Current Slow CRC Block Length Up | Indicates the length of the upstream slow channel data-block, in bytes, on which the CRC operates. (R) (optional) (2 bytes) |
| Current Slow Burst Protect Up | Actual level of upstream impulse noise (burst) protection, in microseconds, for the slow channel. (R) (optional) (2 bytes) |
| Current Fast FEC Up | Actual upstream Forward Error Correction (FEC) redundancy, in percent, related overhead for the fast channel. (R) (optional) (1 byte) |

Actions

Get Get one or more attributes.

Notifications

None.

8.2.5 VDSL Line Configuration Profile

An instance of this managed entity represents a VDSL Line Configuration Profile supported on the ONT. Zero or more VDSL Physical Path Termination Points can reference an instance of a VDSL Line Configuration Profile managed entity.

Instances of this managed entity are created and deleted by the ONT on request of the OLT.

Relationships

Zero or more instances of this managed entity shall be contained in an ONT. One or more instances of this managed entity shall be contained in an ONT containing instances of Physical Path Termination Point VDSL UNI.

Attributes

| | |
|-------------------------------|--|
| Managed Entity ID | This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R) (mandatory) (2 bytes) |
| Down Rate Mode | Specifies the rate selection behavior for the line in the downstream direction. manual(1) forces the rate to the configured rate, adaptAtInit(2) adapts the line based upon line quality. (R, W, Set-by-Create) (optional) (1 byte) |
| Up Rate Mode | Specifies the rate selection behavior for the line in the upstream direction. manual(1) forces the rate to the configured rate, adaptAtInit(2) adapts the line based upon line quality. (R, W, Set-by-Create) (optional) (1 byte) |
| Down Max Power | Specifies the maximum aggregate downstream power level in the range 0 (0) to 14.5 dBm (58) in 0.25 dBm intervals. (R, W, Set-by-Create) (optional) (1 byte) |
| Up Max Power | Specifies the maximum aggregate upstream power level in the range 0 (0) to 14.5 dBm (58) in 0.25 dBm intervals. (R, W, Set-by-Create) (optional) (1 byte) |
| Down Max SNR Margin | Specifies the maximum downstream Signal/Noise Ratio Margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). (R, W, Set-by-Create) (optional) (1 byte) |
| Down Min SNR Margin | Specifies the minimum downstream Signal/Noise Ratio Margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). (R, W, Set-by-Create) (optional) (1 byte) |
| Down Target SNR Margin | Specifies the target downstream Signal/Noise Ratio Margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). This is the Noise Margin the transceivers must achieve with a BER of 10^{-7} or better to successfully complete initialization. (R, W, Set-by-Create) (optional) (1 byte) |
| Up Max SNR Margin | Specifies the maximum upstream Signal/Noise Ratio Margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). (R, W, Set-by-Create) (optional) (1 byte) |
| Up Min SNR Margin | Specifies the minimum upstream Signal/Noise Ratio Margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). (R, W, Set-by-Create) (optional) (1 byte) |
| Up Target SNR Margin | Specifies the target upstream Signal/Noise Ratio Margin in units of 0.25 dB, |

for a range of 0 (0) to 31.75 dB (127). This is the Noise Margin the transceivers must achieve with a BER of 10^{-7} or better to successfully complete initialization. (R, W, Set-by-Create) (optional) (1 byte)

| | |
|-------------------------|--|
| Down PBO Control | Downstream power backoff (PBO) control for this line. For transceivers which do not support downstream PBO control, this object MUST be fixed at disabled(1). If auto(2) is selected, the transceiver will automatically adjust the power backoff. If manual(3) is selected, then the transceiver will use the Down PBO Level. (R, W, Set-by-Create) (optional) (1 byte) |
| Up PBO Control | Upstream power backoff (PBO) control for this line. For transceivers which do not support upstream PBO control, this object MUST be fixed at disabled(1). If auto(2) is selected, the transceiver will automatically adjust the power backoff. If manual(3) is selected, then the transceiver will use the Up PBO Level. (R, W, Set-by-Create) (optional) (1 byte) |
| Down PBO Level | Specifies the downstream backoff level to be used when Down PBO Control = manual(3). Valid range is 0 dB (0) to 40 dB (160) in 0.25 dB intervals. (R, W, Set-by-Create) (optional) (1 byte) |
| Up PBO Level | Specifies the upstream backoff level to be used when Up PBO Control = manual(3). Valid range is 0 dB (0) to 40 dB (160) in 0.25 dB intervals. (R, W, Set-by-Create) (optional) (1 byte) |
| Line Type | <p>This parameter provisions the VDSL physical entity at start-up by defining whether and how the line will be channelized, i.e. which channel type(s) are supported. If the line is to be channelized, the value will be other than noChannel(1).</p> <p>Defined values are noChannel(1) - no channels exist, fastOnly(2) - only the fast channel exists, slowOnly(3) - only the slow channel exists, fastOrSlow(4) - either the fast or the slow channel exists, but only one at a time, fastAndSlow(5) - both fast and slow channels exist. (R, W, Set-by-Create) (optional) (1 byte)</p> |

Actions

| | |
|---------------|--|
| Create | Create an instance of this managed entity. |
| Delete | Delete an instance of this managed entity. |
| Get | Get one or more attributes. |
| Set | Set one or more attributes. |

Notifications

None.

8.2.6 VDSL Channel Configuration Profile

An instance of this managed entity represents a VDSL Channel Configuration Profile supported on the ONT. Zero or more VDSL Physical Path Termination Points can reference an instance of a VDSL Channel Configuration Profile managed entity.

Instances of this managed entity are created and deleted by the ONT on request of the OLT.

Relationships

Zero or more instances of this managed entity shall be contained in an ONT. One or more instances of this managed entity shall be contained in an ONT containing instances of Physical Path Termination Point VDSL UNI.

Attributes

| | |
|----------------------------------|--|
| Managed Entity ID | This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes) |
| Down Rate Ratio | <p>This attribute is the configured allocation ratio of excess downstream transmit bandwidth between fast and slow channels. Only applies when two channel mode and adaptAtInit are supported. Distribute bandwidth on each channel in excess of the corresponding Minimum Transmit Bit Rate so that:</p> $\text{Rate Change Ratio} = [\text{Fast} / (\text{Fast} + \text{Slow})] * 100$ <p>In other words this value is the fast channel percentage. Valid range is 0 to 100. (R, W, Set-by-Create) (optional) (1 byte)</p> |
| Up Rate Ratio | <p>This attribute is the configured allocation ratio of excess upstream transmit bandwidth between fast and slow channels. Only applies when two channel mode and adaptAtInit are supported. Distribute bandwidth on each channel in excess of the corresponding Minimum Transmit Bit Rate so that:</p> $\text{Rate Change Ratio} = [\text{Fast} / (\text{Fast} + \text{Slow})] * 100$ <p>In other words this value is the fast channel percentage. Valid range is 0 to 100. (R, W, Set-by-Create) (optional) (1 byte)</p> |
| Down Slow Max Data Rate | Specifies the maximum downstream slow channel data rate in steps of 64K bits/second. The maximum aggregate downstream transmit speed of the line can be derived from the sum of maximum downstream fast and slow channel data rates. (R, W, Set-by-Create) (optional) (2 bytes) |
| Down Slow Min Data Rate | Specifies the minimum downstream slow channel data rate in steps of 64K bits/second. The minimum aggregate downstream transmit speed of the line can be derived from the sum of minimum downstream fast and slow channel data rates. (R, W, Set-by-Create) (optional) (2 bytes) |
| Up Slow Max Data Rate | Specifies the maximum upstream slow channel data rate in steps of 64K bits/second. The maximum aggregate upstream transmit speed of the line can be derived from the sum of maximum upstream fast and slow channel data rates. (R, W, Set-by-Create) (optional) (2 bytes) |
| Up Slow Min Data Rate | Specifies the minimum upstream slow channel data rate in steps of 64K bits/second. The minimum aggregate upstream transmit speed of the line can be derived from the sum of minimum upstream fast and slow channel data rates. (R, W, Set-by-Create) (optional) (2 bytes) |
| Down Max Interleave Delay | Specifies the maximum interleave delay, in milliseconds, for the downstream slow channel. Valid range is 0 to 255 ms. (R, W, Set-by-Create) (optional) (1 byte) |
| Up Max Interleave Delay | Specifies the maximum interleave delay, in milliseconds, for the upstream slow channel. Valid range is 0 to 255 ms. (R, W, Set-by-Create) (optional) (1 byte) |

| | |
|--------------------------------|---|
| | byte) |
| Down Target Slow Burst | Specifies the target level of impulse noise (burst) protection, in microseconds, for the downstream slow channel. Valid range is 0 to 1275 μ S. (R, W, Set-by-Create) (optional) (2 bytes) |
| Up Target Slow Burst | Specifies the target level of impulse noise (burst) protection, in microseconds, for the upstream slow channel. Valid range is 0 to 1275 μ S. (R, W, Set-by-Create) (optional) (2 bytes) |
| Down Fast Max Data Rate | Specifies the maximum downstream fast channel data rate in steps of 64K bits/second. (R, W, Set-by-Create) (optional) (2 bytes) |
| Down Fast Min Data Rate | Specifies the minimum downstream fast channel data rate in steps of 64K bits/second. (R, W, Set-by-Create) (optional) (2 bytes) |
| Up Fast Max Data Rate | Specifies the maximum upstream fast channel data rate in steps of 64K bits/second. (R, W, Set-by-Create) (optional) (2 bytes) |
| Up Fast Min Data Rate | Specifies the minimum upstream fast channel data rate in steps of 64K bits/second. (R, W, Set-by-Create) (optional) (2 bytes) |
| Down Max Fast FEC | This parameter provisions the maximum level of Forward Error Correction (FEC) redundancy related overhead to be maintained, as a percentage, for the downstream fast channel. Valid range is 0 to 50 percent. (R, W, Set-by-Create) (optional) (1 byte) |
| Up Max Fast FEC | This parameter provisions the maximum level of Forward Error Correction (FEC) redundancy related overhead to be maintained, as a percentage, for the upstream fast channel. Valid range is 0 to 50 percent. (R, W, Set-by-Create) (optional) (1 byte) |

Actions

| | |
|---------------|--|
| Create | Create an instance of this managed entity. |
| Delete | Delete an instance of this managed entity. |
| Get | Get one or more attributes. |
| Set | Set one or more attributes. |

Notifications

None.

8.2.7 VDSL Band Plan Configuration Profile

An instance of this managed entity represents a VDSL Band Plan Configuration Profile supported on the ONT. Zero or more VDSL Physical Path Termination Points can reference an instance of a VDSL Band Plan Configuration Profile managed entity.

Instances of this managed entity are created and deleted by the ONT on request of the OLT.

Relationships

Zero or more instances of this managed entity shall be contained in an ONT. One or more instances of this

managed entity shall be contained in an ONT containing instances of Physical Path Termination Point VDSL UNI.

Attributes

| | |
|--------------------------|---|
| Managed Entity ID | This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes) |
| Band Plan | The VDSL band plan to be used for the line. bandPlan997(1) is to be used for ITU-T G.993.1 Bandplan-B, ETSI Bandplan, ANSI Plan 997. bandPlan998(2) is to be used for ITU-T G.993.1 Bandplan-A, ANSI Plan 998. bandPlanFx(3) is to be used for ITU-T G.993.1 Bandplan-C. other(4) is to be used for non-standard band plans. If this object is set to bandPlanFx(3), then Band Plan FX MUST also be set. (R, W, Set-by-Create) (optional) (1 byte) |
| Band Plan FX | The frequency limit, in kHz, between bands D2 and U2 when the Band Plan is set to bandPlanFx(3). Valid range is 3,750 to 12,000 kHz. (R, W, Set-by-Create) (optional) (2 bytes) |
| Band Opt Usage | Defines the VDSL link use of the optional frequency range [25kHz - 138kHz] (Opt). unused(1) indicates Opt is unused, upstream(2) indicates Opt usage is for upstream, downstream(3) indicates Opt usage is for downstream. (R, W, Set-by-Create) (optional) (1 byte) |
| Up PSD Template | The upstream PSD template to be used for the line. Here, templateMask1(1) refers to a notched mask that limits the transmitted PSD within the internationally standardized HAM (Handheld Amateur Radio) radio bands, while templateMask2(2) refers to an unnotched mask. The masks themselves depend upon the applicable standard being used (Applicable Standard). (R, W, Set-by-Create) (optional) (1 byte) |
| Down PSD Template | The downstream PSD template to be used for the line. Here, templateMask1(1) refers to a notched mask that limits the transmitted PSD within the internationally standardized HAM (Handheld Amateur Radio) radio bands, while templateMask2(2) refers to an unnotched mask. The masks themselves depend upon the applicable standard being used (Applicable Standard). (R, W, Set-by-Create) (optional) (1 byte) |
| HAM Band Mask | The transmit power spectral density mask code, used to avoid interference with HAM (Handheld Amateur Radio) radio bands by introducing power control (notching) in one or more of these bands. Amateur radio band notching is defined in the VDSL spectrum as follows: |

| Band | Start Frequency | Stop Frequency |
|------|-----------------|----------------------------------|
| 30m | 1810 kHz | 2000 kHz |
| 40m | 3500 kHz | 3800 kHz (ETSI); 4000 kHz (ANSI) |
| 80m | 7000 kHz | 7100 kHz (ETSI); 7300 kHz (ANSI) |
| 160m | 10100 kHz | 10150 kHz |

Notching for each standard band can be enabled or disabled via this bit mask. Two custom notches may be specified. If customNotch1 is enabled, then both **Custom Notch 1 Start** and **Custom Notch 1 Stop** MUST be specified. If customNotch2 is enabled, then both **Custom Notch 2 Start** and **Custom Notch**

2 Stop MUST be specified. Valid bit values are defined as follows, all combinations are allowed:

customNotch1(0) - custom (region-specific) notch
 customNotch2(1) - custom (region-specific) notch
 amateurBand30m(2) - amateur radio band notch
 amateurBand40m(3) - amateur radio band notch
 amateurBand80m(4) - amateur radio band notch
 amateurBand160m(5) - amateur radio band notch

(R, W, Set-by-Create) (optional) (1 byte)

Custom Notch 1 Start Specifies the start frequency, in kHz, of custom HAM (Handheld Amateur Radio) notch 1. This field MUST be less than or equal to **Custom Notch 1 Stop**. Valid range is 0 to 65,535 kHz. (R, W, Set-by-Create) (optional) (2 bytes)

Custom Notch 1 Stop Specifies the stop frequency, in kHz, of custom HAM (Handheld Amateur Radio) notch 1. This field MUST be greater than or equal to **Custom Notch 1 Start**. (R, W, Set-by-Create). Valid range is 0 to 65,535 kHz. (optional) (2 bytes)

Custom Notch 2 Start Specifies the start frequency, in kHz, of custom HAM (Handheld Amateur Radio) notch 2. This field MUST be less than or equal to **Custom Notch 2 Stop**. Valid range is 0 to 65,535 kHz. (R, W, Set-by-Create) (optional) (2 bytes)

Custom Notch 2 Stop Specifies the stop frequency, in kHz, of custom HAM (Handheld Amateur Radio) notch 2. This field MUST be greater than or equal to **Custom Notch 2 Start**. Valid range is 0 to 65,535 kHz. (R, W, Set-by-Create) (optional) (2 bytes)

Deployment Scenario The VDSL line deployment scenario. When using fitCab(1), the VTU-C is located in a street cabinet. When using fitEx(2), the VTU-C is located at the central office. Changes to this value will have no effect on the transceiver. (R, W, Set-by-Create) (optional) (1 byte)

ADSL Presence Indicates presence of ADSL service in the associated cable bundle/binder. none(1) indicates no ADSL service in the bundle, adslOverPots(2) indicates ADSL service over POTS is present in the bundle, adslOverISDN(3) indicates ADSL service over ISDN is present in the bundle. (R, W, Set-by-Create) (optional) (1 byte)

Applicable Standard The VDSL standard to be used for the line. ansi(1) indicates ANSI standard, etsi(2) indicates ETSI standard, itu(3) indicates ITU standard, other(4) indicates a standard other than the above. (R, W, Set-by-Create) (optional) (1 byte)

Actions

Create Create an instance of this managed entity.

Delete Delete an instance of this managed entity.

Get Get one or more attributes.

Set Set one or more attributes.

Notifications

None.

8.2.8 VDSL VTU-O Physical Interface Monitoring History Data

This managed entity contains the last completed 15-minute interval collected statistic data for a VDSL physical interface.

Instances of this managed entity are created/deleted by the OLT after an instance of the Physical Path Termination Point VDSL UNI managed entity is created/deleted.

The performance management of the physical interfaces used by VDSL shall be supported. *Failure/notifications should include threshold alerts for unacceptable performance (error) rates. Performance data should include transmission counts of Errored Seconds (ES), Severely Errored Seconds (SES) and Unavailable Seconds (UAS).*

Relationships

One instance of this managed entity can exist for each instance of the Physical Path Termination Point VDSL UNI.

Attributes

| | |
|--|---|
| Managed Entity ID | This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot id. The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes) |
| Interval End Time: | This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 during the first period after this, and so on. If this managed entity is created after the reception of the "synchronize time" action, the value of this attribute is set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. The attribute counters are updated at the end of the interval. (R) (mandatory) (1 byte) |
| Threshold Data_{B-PON} ID | This attribute provides a pointer to an instance of the Threshold Data _{B-PON} managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, Set by-create) (mandatory) (2 bytes) |
| Loss of Framing Seconds | Count of seconds during this interval that there was Loss of Framing. (R) (optional) (2 bytes) |
| Loss of Signal Seconds | Count of seconds during this interval that there was Loss of Signal. (R) (optional) (2 bytes) |
| Loss of Power Seconds | Count of seconds during this interval that there was Loss of Power. (R) (optional) (2 bytes) |
| Loss of Link Seconds | Count of seconds during this interval that there was Loss of Link. (R) (optional) (2 bytes) |
| Errored Seconds | Count of Errored Seconds during this interval. An Errored Second is a one-second interval containing one or more CRC anomalies, or one or more LOS or LOF defects. (R) (optional) (2 bytes) |

| | |
|---------------------------------|---|
| Severely Errored Seconds | Count of Severely Errored Seconds during this interval. (R) (optional) (2 bytes) |
| Unavailable Seconds | Count of Unavailable Seconds during this interval. (R) (optional) (2 bytes) |
| Line Initializations | Count of the line initialization attempts during this interval. This count includes both successful and failed attempts. (R) (optional) (2 bytes) |

Actions

| | |
|-------------------------|--|
| Create | Create an instance of this managed entity. |
| Delete | Delete an instance of this managed entity. |
| Get | Get one or more attributes. |
| Get Current Data | Get the current value of one or more attributes. |
| Set | Set one or more attributes. |

Notifications

| | |
|---------------------------------|--|
| Threshold Crossing Alert | This notification is used to notify the management system when a threshold crossing alert (TCA) is detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the actual counters are reset to 0x00. Both ONT and OLT should know the event list used by this entity. The list of TCAs for this entity is given in Table 12/G.omci.xdsl. |
|---------------------------------|--|

Table 12/G.omci.xdsl Alarm list for VDSL VTU-O Physical Interface Monitoring History Data

| Number | Event | Description |
|--------|--------------------------|-------------------|
| | Threshold Crossing Alert | |
| 0 | LOFS | Exceeds threshold |
| 1 | LOSS | Exceeds threshold |
| 2 | LOLS | Exceeds threshold |
| 3 | LOPS | Exceeds threshold |
| 4 | ES | Exceeds threshold |
| 5 | LI | Exceeds threshold |
| 6 | SES | Exceeds threshold |
| 7 | UAS | Exceeds threshold |
| 8-255 | Reserved | |

8.2.9 VDSL VTU-R Physical Interface Monitoring History Data

This managed entity contains the last completed 15-minute interval collected statistic data for a VDSL physical interface.

Instances of this managed entity are created/deleted by the OLT after an instance of the Physical Path Termination Point VDSL UNI managed entity is created/deleted.

The performance management of the physical interfaces used by VDSL shall be supported. Failure/notifications should include threshold alerts for unacceptable performance (error) rates. Performance data should include transmission counts of Errored Seconds (ES), Severely Errored Seconds (SES) and Unavailable Seconds (UAS).

Relationships

One instance of this managed entity can exist for each instance of the Physical Path Termination Point VDSL UNI.

Attributes

| | |
|-------------------------------------|---|
| Managed Entity ID | This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot id. The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes) |
| Interval End Time: | This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 during the first period after this, and so on. If this managed entity is created after the reception of the "synchronize time" action, the value of this attribute is set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. The attribute counters are updated at the end of the interval. (R) (mandatory) (1 byte) |
| Threshold DataB-PON ID | This attribute provides a pointer to an instance of the Threshold DataB-PON managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, Set by-create) (mandatory) (2 bytes) |
| Loss of Framing Seconds | Count of seconds during this interval that there was Loss of Framing. (R) (optional) (2 bytes) |
| Loss of Signal Seconds | Count of seconds during this interval that there was Loss of Signal. (R) (optional) (2 bytes) |
| Loss of Power Seconds | Count of seconds during this interval that there was Loss of Power. (R) (optional) (2 bytes) |
| Loss of Link Seconds | Count of seconds during this interval that there was Loss of Link. (R) (optional) (2 bytes) |
| Errored Seconds | Count of Errored Seconds during this interval. An Errored Second is a one-second interval containing one or more CRC anomalies, or one or more LOS or LOF defects. (R) (optional) (2 bytes) |
| Severely Errored Seconds | Count of Severely Errored Seconds during this interval. (R) (optional) (2 bytes) |
| Unavailable Seconds | Count of Unavailable Seconds during this interval. (R) (optional) (2 bytes) |
| Line Initializations | Count of the line initialization attempts during this interval. This count includes both successful and failed attempts. (R) (optional) (2 bytes) |

Actions

| | |
|---------------|--|
| Create | Create an instance of this managed entity. |
|---------------|--|

| | |
|-------------------------|--|
| Delete | Delete an instance of this managed entity. |
| Get | Get one or more attributes. |
| Get Current Data | Get the current value of one or more attributes. |
| Set | Set one or more attributes. |

Notifications

| | |
|---------------------------------|--|
| Threshold Crossing Alert | This notification is used to notify the management system when a threshold crossing alert (TCA) is detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the actual counters are reset to 0x00. Both ONT and OLT should know the event list used by this entity. The list of TCAs for this entity is given in Table 13/G.omci.xdsl. |
|---------------------------------|--|

Table 13/G.omci.xdsl Alarm list for VDSL VTU-R Physical Interface Monitoring History Data

| Number | Event | Description |
|--------|--------------------------|-------------------|
| | Threshold Crossing Alert | |
| 0 | LOFS | Exceeds threshold |
| 1 | LOSS | Exceeds threshold |
| 2 | LOLS | Exceeds threshold |
| 3 | LOPS | Exceeds threshold |
| 4 | ES | Exceeds threshold |
| 5 | LI | Exceeds threshold |
| 6 | SES | Exceeds threshold |
| 7 | UAS | Exceeds threshold |
| 8-255 | Reserved | |

8.2.10 VDSL VTU-O Channel Performance Monitoring History Data

This managed entity contains the last completed 15-minute interval collected statistic data for both fast and slow VDSL channels, as seen from the VTU-O.

Instances of this managed entity are created/deleted by the OLT after an instance of the Physical Path Termination Point VDSL UNI managed entity is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of the Physical Path Termination Point VDSL UNI.

Attributes

| | |
|--------------------------|---|
| Managed Entity ID | This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of |
|--------------------------|---|

the UNI. The first byte is the slot id. The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes)

Interval End Time: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 during the first period after this, and so on. If this managed entity is created after the reception of the "synchronize time" action, the value of this attribute is set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. The attribute counters are updated at the end of the interval. (R) (mandatory) (1 byte)

Threshold Data_{B-PON} ID This attribute provides a pointer to an instance of the Threshold Data_{B-PON} managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, Set by-create) (mandatory) (2 bytes)

Fast Channel Corrected Blocks This attribute is the count of all blocks received by the VTU-O with errors that were corrected on the fast channel within the previous 15 minute interval. (R) (optional) (4 bytes)

Fast Channel Bad Blocks This attribute is the count of all blocks received by the VTU-O with uncorrectable errors on the fast channel within the previous 15 minute interval. (R) (optional) (4 bytes)

Fast Channel Transmitted Blocks This attribute is the count of all blocks transmitted by the VTU-O on the fast channel within the previous 15 minute interval. (R) (optional) (4 bytes)

Slow Channel Corrected Blocks This attribute is the count of all blocks received by the VTU-O with errors that were corrected on the slow channel within the previous 15 minute interval. (R) (optional) (4 bytes)

Slow Channel Bad Blocks This attribute is the count of all blocks received by the VTU-O with uncorrectable errors on the slow channel within the previous 15 minute interval. (R) (optional) (4 bytes)

Slow Channel Transmitted Blocks This attribute is the count of all blocks transmitted by the VTU-O on the slow channel within the previous 15 minute interval. (R) (optional) (4 bytes)

Actions

| | |
|-------------------------|--|
| Create | Create an instance of this managed entity. |
| Delete | Delete an instance of this managed entity. |
| Get | Get one or more attributes. |
| Get Current Data | Get the current value of one or more attributes. |
| Set | Set one or more attributes. |

Notifications

Threshold Crossing Alert This notification is used to notify the management system when a threshold crossing alert (TCA) is detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the actual counters are reset to 0x00. Both ONT and OLT should know the event list used by this entity. The list of TCAs for this entity

is given in Table 14/G.omci.xdsl.

Table 14/G.omci.xdsl Alarm list for VDSL VTU-O Channel Performance Monitoring History Data

| Number | Event | Description |
|--------|--------------------------|-------------------|
| | Threshold Crossing Alert | |
| 0 | FCCB | Exceeds threshold |
| 1 | FCBB | Exceeds threshold |
| 2 | ICCB | Exceeds threshold |
| 3 | ICBB | Exceeds threshold |
| 4-255 | Reserved | |

8.2.11 VDSL VTU-R Channel Performance Monitoring History Data

This managed entity contains the last completed 15-minute interval collected statistic data for both fast and slow VDSL channels, as seen from the VTU-R.

Instances of this managed entity are created/deleted by the OLT after an instance of the Physical Path Termination Point VDSL UNI managed entity is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of the Physical Path Termination Point VDSL UNI.

Attributes

Managed Entity ID This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot id. The second byte is the port id with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes)

Interval End Time: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 during the first period after this, and so on. If this managed entity is created after the reception of the "synchronize time" action, the value of this attribute is set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. The attribute counters are updated at the end of the interval. (R) (mandatory) (1 byte)

Threshold Data_{B-PON} ID This attribute provides a pointer to an instance of the Threshold Data_{B-PON} managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, Set by-create) (mandatory) (2 bytes)

Fast Channel Corrected Blocks This attribute is the count of all blocks received by the VTU-R with errors that were corrected on the fast channel within the previous 15 minute

| | |
|--|--|
| | interval. (R) (optional) (4 bytes) |
| Fast Channel Bad Blocks | This attribute is the count of all blocks received by the VTU-R with uncorrectable errors on the fast channel within the previous 15 minute interval. (R) (optional) (4 bytes) |
| Fast Channel Transmitted Blocks | This attribute is the count of all blocks transmitted by the VTU-R on the fast channel within the previous 15 minute interval. (R) (optional) (4 bytes) |
| Slow Channel Corrected Blocks | This attribute is the count of all blocks received by the VTU-R with errors that were corrected on the slow channel within the previous 15 minute interval. (R) (optional) (4 bytes) |
| Slow Channel Bad Blocks | This attribute is the count of all blocks received by the VTU-R with uncorrectable errors on the slow channel within the previous 15 minute interval. (R) (optional) (4 bytes) |
| Slow Channel Transmitted Blocks | This attribute is the count of all blocks transmitted by the VTU-R on the slow channel within the previous 15 minute interval. (R) (optional) (4 bytes) |

Actions

| | |
|-------------------------|--|
| Create | Create an instance of this managed entity. |
| Delete | Delete an instance of this managed entity. |
| Get | Get one or more attributes. |
| Get Current Data | Get the current value of one or more attributes. |
| Set | Set one or more attributes. |

Notifications

| | |
|---------------------------------|--|
| Threshold Crossing Alert | This notification is used to notify the management system when a threshold crossing alert (TCA) is detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the actual counters are reset to 0x00. Both ONT and OLT should know the event list used by this entity. The list of TCAs for this entity is given in Table 15/G.omci.xdsl. |
|---------------------------------|--|

Table 15/G.omci.xdsl Alarm list for VDSL VTU-O Channel Performance Monitoring History Data

| Number | Event | Description |
|--------|--------------------------|-------------------|
| | Threshold Crossing Alert | |
| 0 | FCCB | Exceeds threshold |
| 1 | FCBB | Exceeds threshold |
| 2 | ICCB | Exceeds threshold |
| 3 | ICBB | Exceeds threshold |
| 4-255 | Reserved | |

9 Managed Entity identifiers

The ONT management and control protocol cell format is defined in Recommendation G.983.2. As new managed entities are introduced into the OMCI specifications, the managed entity identifier that is

used in the message identifier field shall be defined. Table 14/G.omci.xdsl gives the class values for the new managed entities. The class values for existing managed entities are found in Table 16/G.983.2.

Table 16/ G.omci.xdsl – Managed entity identifiers

| Managed entity class value | Managed entity |
|-------------------------------|--|
| 101 | Physical Path Termination Point ADSL UNI Part 1 |
| 102 | Physical Path Termination Point ADSL UNI Part 2 |
| 103 | ADSL Line Inventory and Status Data Part 1 |
| 104 | ADSL Line Inventory and Status Data Part 2 |
| 105 | ADSL Channel Downstream Status Data |
| 106 | ADSL Channel Upstream Status Data |
| 107 | ADSL Line Configuration Profile Part 1 |
| 108 | ADSL Line Configuration Profile Part 2 |
| 109 | ADSL Line Configuration Profile Part 3 |
| 110 | ADSL Channel Configuration Profile |
| 111 | ADSL Subcarrier Mask Downstream Profile |
| 112 | ADSL Subcarrier Mask Upstream Profile |
| 113 | ADSL Downstream PSD Mask Profile |
| 114 | ADSL Downstream RFI Bands Profile |
| 115 | ADSL ATU-C Performance Monitoring History Data |
| 116 | ADSL ATU-R Performance Monitoring History Data |
| 117 | ADSL ATU-C Channel Performance Monitoring History Data |
| 118 | ADSL ATU-R Channel Performance Monitoring History Data |
| 119 | TC Adaptor Performance Monitoring History Data ADSL |
| 120 | Physical Path Termination Point VDSL UNI |
| 121 | VDSL VTU-O Physical Data |
| 122 | VDSL VTU-R Physical Data |
| 123 | VDSL Channel Data |
| 124 | VDSL Line Configuration Profile |
| 125 | VDSL Channel Configuration Profile |
| 126 | VDSL Band Plan Configuration Profile |
| 127 | VDSL VTU-O Physical Interface Monitoring History Data |
| 128 | VDSL VTU-R Physical Interface Monitoring History Data |
| 129 | VDSL VTU-O Channel Performance Monitoring History Data |
| 130 | VDSL VTU-R Channel Performance Monitoring History Data |
| 131 | VC UPC Disagreement Monitoring History Data B-PON |

APPENDIX I

Bibliography

- [App.I-1] IETF RFC 2662 Definition of Managed Objects for ADSL Lines
- [App.I-2] IETF RFC 3440 Definitions of Extension Managed Objects for Asymmetric Digital Subscriber Lines
- [App.I-2] IETF draft: Definitions of Managed Objects for Very High Speed Digital Subscriber Lines (VDSL)
- [App.I-3] IETF draft : Definitions of Managed Object Extensions for Very High Speed Digital Subscriber Lines (VDSL) Using Single Carrier Modulation (SCM) Line Coding
- [App.I-4] IETF draft : Definitions of Managed Object Extensions for Very High Speed Digital Subscriber Lines (VDSL) Using Multiple Carrier Modulation (MCM) Line Coding
- [App I-5] ITU-T G.997.1 (May 2003): Physical Layer Management for Digital Subscriber Line (DSL) Transceivers.
- [App I-6] ITU-T G.997.1 Amendment 1 (October 2003)
- [App I-7] DSL Forum TR-057 (February 2003): VDSL Network Element Management